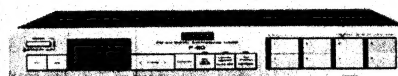




# Service Manual

**CIRCUIT DESCRIPTIONS  
REPAIR & ADJUSTMENTS**



**ORDER NO.  
ARP-326-0**

**FM/AM DIGITAL SYNTHESIZED TUNER**

## F-90

**MODEL F-90 COMES IN SEVEN VERSIONS DISTINGUISHED AS FOLLOWS:**

Type	Voltage	Remarks
KU	AC120V only	U.S.A. model
HE	AC220V, 240V (switchable)	European continent model
HB	AC220V, 240V (switchable)	United Kingdom model
S	AC110V, 120V, 220V, 240V, 240V (switchable)	General export model
S/G	AC110V, 120V, 220V, 240V (switchable)	U.S. Military model
SS	AC110V, 120V, 220V, 240V (switchable)	South Africa model
HEZ	AC220V, 240V (switchable)	West Germany model

- This service manual is applicable to the KU type. For servicing of the HE and HB types, please refer to the pp. 44 – 50.

For servicing of the other types, please refer to the Additional Service Manual.

- Ce manuel d'instruction se réfère au mode de réglage, en français.
- Este manual de de servicio trata del método de ajuste escrito en español.

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# 1. SPECIFICATIONS

## FM Tuner Section

Frequency range	87.5 MHz to 108 MHz
Usable Sensitivity	10.8 dBf, IHF (0.95 $\mu$ V/75 $\Omega$ )
50 dB Quieting Sensitivity	
	Mono; 16.2 dBf, IHF (1.8 $\mu$ V/75 $\Omega$ )
	Stereo; 37.7 dBf, IHF (21.0 $\mu$ V/75 $\Omega$ )
Sensitivity (DIN)	Mono; 0.75 $\mu$ V/75 $\Omega$
	Stereo; 22.0 $\mu$ V/75 $\Omega$
Signal-to-Noise Ratio	Mono; 93 dB (at 80 dBf)
	Stereo; 86 dB (at 80 dBf)
Signal-to-Noise Ratio (DIN)	Mono; 83 dB
	Stereo; 77 dB
Distortion (at 80 dBf)	
WIDE	Mono; 0.0095% (100 Hz)
	0.0095% (1 kHz)
	0.01% (10 kHz)
	Stereo; 0.02% (100 Hz)
	0.02% (1 kHz)
	0.07% (10 kHz)
NARROW	Mono; 0.09% (1 kHz)
	Stereo; 0.5% (1 kHz)
Capture Ratio	0.8 dB (WIDE)
Alternate Channel Selectivity	85 dB (400 kHz) (NARROW)
Stereo Separation	
WIDE	65 dB (1 kHz)
	50 dB (20 Hz to 10 kHz)
NARROW	40 dB (20 Hz to 10 kHz)
Frequency Response	20 Hz to 15 KHz $\pm \frac{1}{2}$ dB
Muting Threshold	25.2 dBf (5 $\mu$ V/75 $\Omega$ )
Antenna Input	300 $\Omega$ balanced
	75 $\Omega$ unbalanced

## AM Tuner Section

Frequency range	522 kHz to 1,611 kHz
	(When 10 kHz step) 520 kHz to 1,610 kHz
Sensitivity (IHF, Loop antenna)	150 $\mu$ V/m
Signal-to-Noise Ratio	50 dB
Antenna	Loop Antenna

## Audio Section

Output (Level/Impedance)	
FM (100% MOD) FIXED	650 mV/900 $\Omega$
AM (30% MOD) FIXED	150 mV/900 $\Omega$

## Miscellaneous

### Power Requirements

HE model	a.c. 220 Volts $\sim$ , 50/60 Hz
HB model	a.c. 240 Volts $\sim$ , 50/60 Hz
YP model	a.c. 240 Volts $\sim$ , 50 Hz
KU and KC models	AC 120 V, 60 Hz
S, SS and S/G models	AC 110/120/220/240 V (switchable) 50/60 Hz

### Power Consumption

HE model	14 W
HB model	14 W
YP model	14 W
KU and KC models	14 W
S, SS and S/G models	14 W
Dimensions	420(W) x 61(H) x 317(D) mm
	16-9/16(W) x 2-3/8(H) x 12-1/2(D) in
Weight (without package)	4.5 kg (9 lb 15 oz)

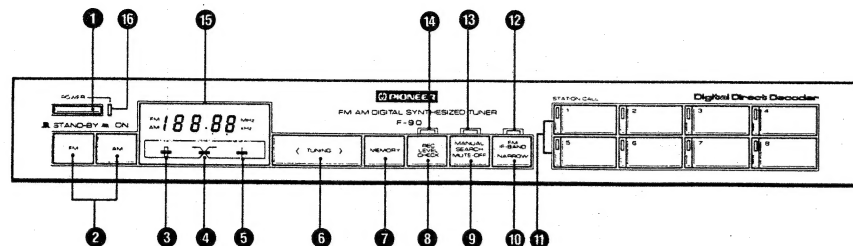
## Furnished Parts

FM T-type Antenna	1
AM Loop Antenna	1
Connection Cord with Pin Plugs	1
F-type plug (except HE, HB and YP models)	1
Operating Instructions	1

### NOTE:

Specifications and design subject to possible modification without notice.

## 2. FRONT PANEL FACILITIES



### 1 POWER SWITCH (POWER)

When this switch is set to the ON position, the POWER indicator lights up, and power is supplied to the tuner's main circuits. The unit's POWER switch is geared to selecting the transformer's secondary and so even at the STAND-BY position, the unit's circuitry will work as long as the power cord is connected to power outlet. Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time.

### 2 FUNCTION SWITCHES

These are used to select either the FM or AM broadcasting bands. The frequency indicating portion of the display will also change.

FM: Push to receive FM band broadcasts.

AM: Push to receive AM band broadcasts.

### 3 TUNED INDICATOR

This lights up to indicate when finest tuning of a station has been achieved.

### 4 FM STEREO INDICATOR

This lights when a stereo program has been picked up during an FM broadcast.

### 5 MEMORY INDICATOR

This lights up when the MEMORY switch is depressed.

### 6 TUNING SWITCHES

These are used to locate stations. Push the left half of this switch "<" to locate a station broadcasting on a lower frequency and the right half of this switch ">" to locate a station broadcasting on a higher frequency.

### 7 MEMORY SWITCH

This is used to memorize stations. Once a station has been memorized using the STATION CALL switches, all that is necessary to recall the station of your choice is to press the appropriate STATION CALL switch. The MEMORY completely does away with the need for manual tuning when selecting your favorite stations.

### 8 RECORDING LEVEL CHECK SWITCH (REC LEVEL CHECK)

Press this switch to check the recording level when recording FM broadcasts on tape.

When the REC LEVEL CHECK switch is pressed (ON), the REC LEVEL CHECK indicator will light up and FM recording reference level signals of about 330 Hz, FM 50% modulation or equivalent will be emitted from the OUTPUT terminals. (The same signals are emitted in case of recording AM broadcasts.) Adjust the recording level of the tape deck when it is in recording mode. For the cassette tape deck set the LEVEL METER indicator to 0 ~ +2 dB.

When the RECORDING LEVEL CHECK is completed, return the switch to the OFF position. (The indicator goes off.) If this switch is left in the ON position, a "beep" sound will occur and the broadcasts cannot be received.

### 9 MANUAL SEARCH MUTE-OFF SWITCH

This is the switch that allows you to choose between AUTO SEARCH and MANUAL tuning. FM MUTING functions when the AUTO SEARCH is in use, but does not function during MANUAL tuning. The indicator lights up during MANUAL tuning. The purpose of FM MUTING is to eliminate static occurring between FM stations. However, reception of your desired station may sometimes not be possible when receiving over long distances or when signals are weak if the FM MUTING switch is in the ON position. In such cases, cancel FM MUTING and select the desired station manually. When the FM MUTING switch is in the OFF position, it will only be possible to receive in MONO not in STEREO. It is recommended that you leave the FM MUTING switch ON for your normal listening enjoyment, especially when receiving from stations with weak input signals. MUTING only works for FM broadcasts. The position of this switch will not affect AM broadcasts.

### 10 FM IF-BAND SWITCH

This switch makes it possible to change passing bands for signals of intermediate frequencies during FM broadcasts. Press once for NARROW BAND reception. The FM IF indicator will light up. Press again for WIDE BAND reception and the indicator will go out.

#### NARROW BAND:

If there are other stations located near the station of your choice, you may find you are receiving interference from them and reception is poor. In such a case, turn on to NARROW BAND to effectively eliminate any interference.

#### WIDE BAND:

If there are no other stations located near the station of your choice and you are in a good area for reception, turn on to WIDE BAND for high-quality tone and superb reception.

### 11 STATION CALL SWITCHES

These are used to preset and recall broadcasting stations thereby eliminating the necessity of using the TUNING switches to locate your favorite stations.

### 12 FM IF-BAND NARROW INDICATOR

### 13 MANUAL SEARCH MUTE-OFF INDICATOR

### 14 RECORDING LEVEL CHECK INDICATOR

### 15 FREQUENCY DISPLAY

This shows the frequency of the station currently being received in digital form. The FM band is indicated by MHz, and the AM band is by kHz.

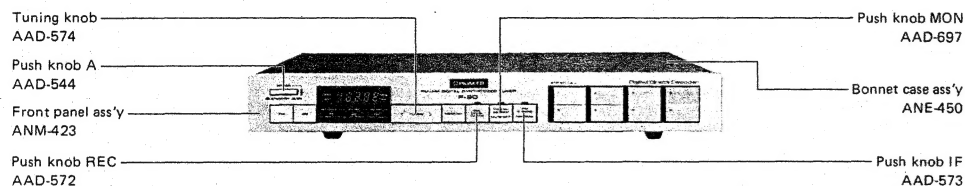
### 16 POWER INDICATOR

### 3. PARTS LOCATION

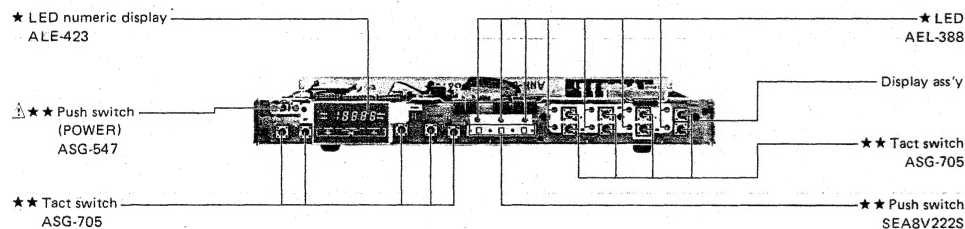
#### NOTES:

- The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks  $\star\star$  and  $\star$ .  
 $\star\star$  **GENERALLY MOVES FASTER THAN  $\star$**   
 This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

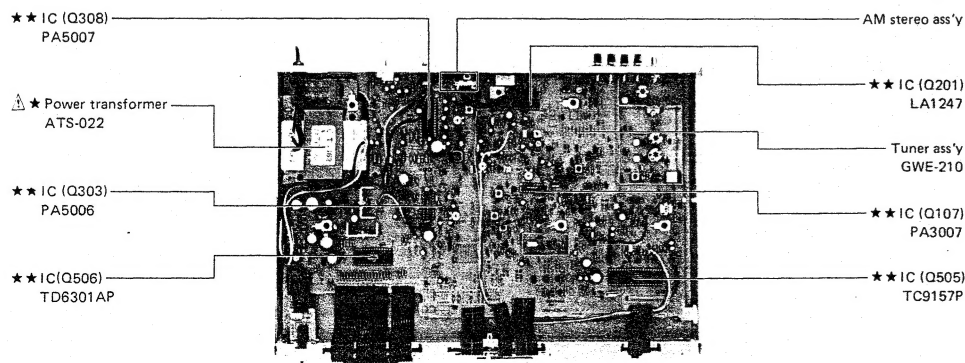
#### Front Panel View



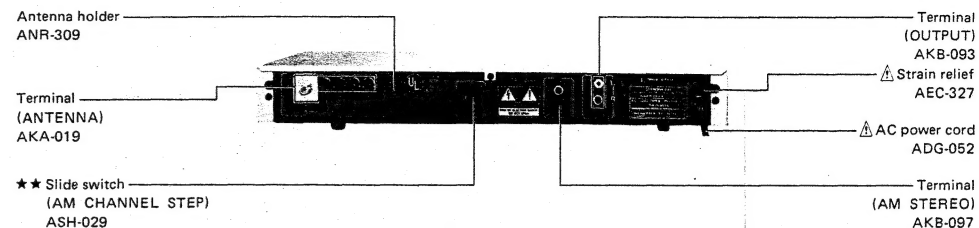
#### Front View with Panel Removed



#### Top View



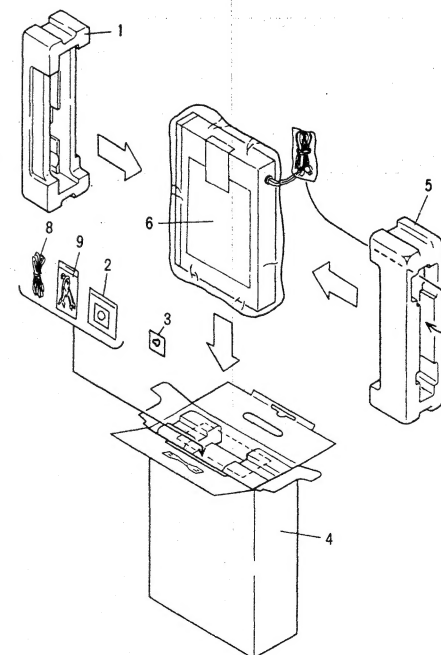
#### Rear Panel View



### 4. PACKING

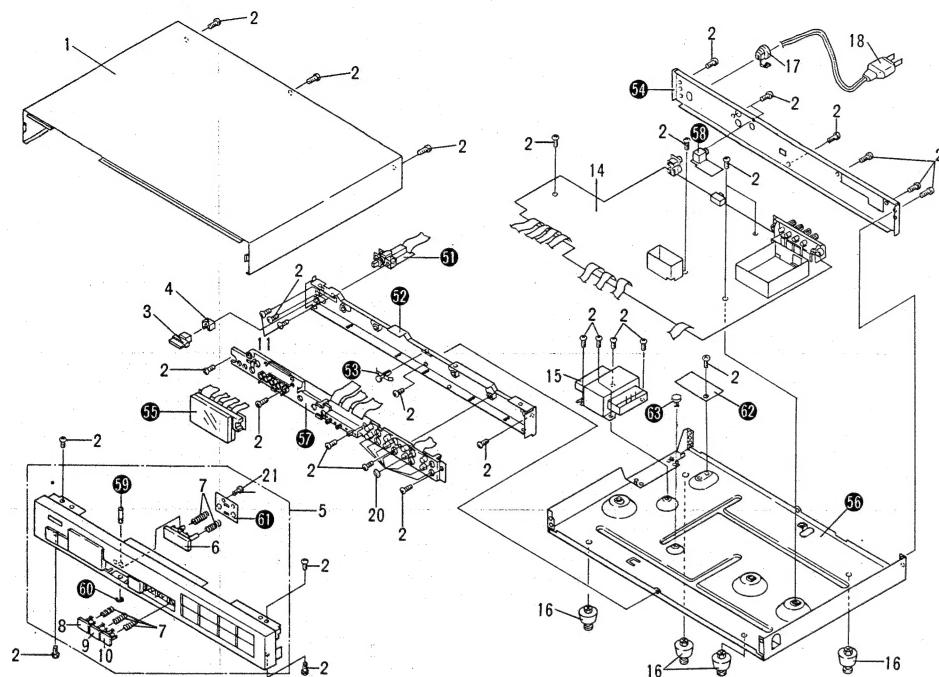
#### Parts List

Mark	No.	Part No.	Description
	1	AHA-248	Front pad
	2	ATB-086	AM loop antenna ass'y
	3	AKX-056	Coaxial connector
	4	AHE-210	Packing case
	5	AHA-249	Rear pad
	6	ARB-562	Operating instructions
	7	ADH-005	FM antenna
	9	ADE-015	Connection cord





## 5. EXPLODED VIEW

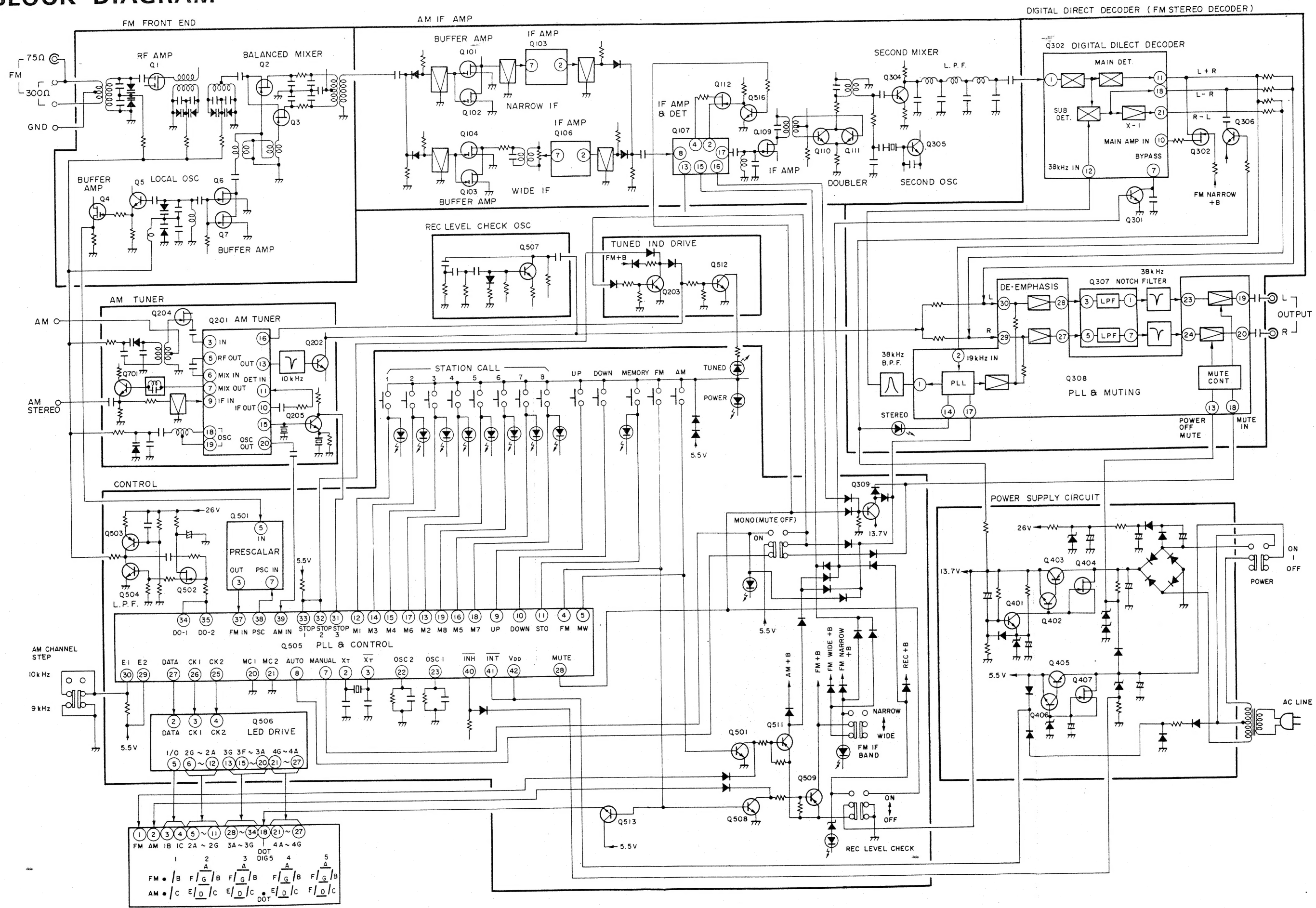


## NOTES:

- Parts without part number cannot be supplied.
  - The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
  - For your Parts Stock Control, the fast moving items are indicated with the marks  $\star\star$  and  $\star$ .
- $\star\star$  GENERALLY MOVES FASTER THAN  $\star$**
- This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1	ANE-450	Bonnet case ass'y		51		Switch ass'y
	2	BBZ30P080FZK	Screw (3x8)		52		Front stay
	3	AAD-544	Push knob A		53		P.C. Board spacer
	4	AEC-743	Flexible ring		54		Rear panel
	5	ANM-423	Front panel ass'y		55		LED ass'y
	6	AAD-574	Tuning knob		56		Chassis
	7	ABH-095	Coiled spring		57		Display ass'y
	8	AAD-572	Push knob REC		58		AM stereo ass'y
	9	AAD-697	Push knob MON		59		Shaft
	10	AAD-573	Push knob IF		60		C ring
	11	VMZ30P060FMC	Screw (3x6)		61		Bracket
	12		-----		62		Terminal ass'y
	13		-----		63		Spacer
	14	GWE-210	Tuner ass'y				
$\Delta$	$\star$ 15	ATS-022	Power transformer				
	16	AEP-016	Foot ass'y				
$\Delta$	17	AEC-327	Strain relief				
$\Delta$	18	ADG-073	AC power cord				

6. BLOCK DIAGRAM



## 7. CIRCUIT DESCRIPTIONS

### 7.1 OUTLINE OF THE TC9157P

Pin No.	Symbol	I/O	Name	Function
1	GND	—	GND terminal	
2	XT	—	Crystal oscillator terminal	Connect to a 7.2MHz reference frequency crystal oscillator.
3	XT	—	Crystal oscillator terminal	
4	FM	I/O	FM band selector input	Reciprocally reset type FM/MW/LW band switching (LW not used).
5	MW	I/O	MW band selector input	
6	LW	I/O	LW band selector input	
7	MANUAL	I/O	Manual tuning mode selector input	Reciprocally reset type UP/DOWN tuning manual and auto search mode switching.
8	AUTO	I/O	Auto search tuning mode selector input	
9	UP	I	UP operation key input	Connect push-button keys for UP/DOWN tuning operation.
10	DOWN	I	DOWN operation key input	
11	STO	I/O	Memory storage instruction input	Preset memory write status set by this input.
12~19	MI~M8	I/O	Preset memory channel selector input	Control of 16-station preset memory write/read in combination with the MC1/MC2 input.
20	MC1	I/O	Memory control input	16 preset memories can be fixed at 8 stations each for AM and FM respectively, or set to random selection (total of 16 FM/AM stations).
21	MC2			
22	OSC2	—	AM oscillator input	CR connection for oscillator used to set scanning speed during AM search mode.
23	OSC1	—	FM oscillator input	CR connection for oscillator used to set scanning speed during FM search mode.
24	O/5	O	FM 50kHz output	Display output of FM band in 50kHz steps (Europe). "H" output for 50kHz.
25	CK2	O	Tuned frequency data serial output	Output passed to tuned frequency digital display driver (TD6301AP). Output of serial data and timing clock.
26	CK1			
27	DATA	O	Muting signal output	"H" output when switching band, during tuning search mode, and during STATION CALL operation.
28	MUTE	O	Muting signal output	
29	E2	I	Region designation input	Designation of Japan, USA, and Europe regions
30	E1			
31	STOP3	I	AM-IF signal input	Counting of the 450kHz signal during AM mode, and stopping of auto search.
32	STOP2	I	Auto search signal input	Auto search scanning speed reduced by half when "H" input is applied.
33	STOP1	I	Slow scanning speed input	
34	DO-2	O	Phase comparator output	Two parallel tri-state buffer outputs obtained from one phase comparator.
35	DO-1			
36	TEST	I	Test terminal	Switch to test mode by "H" level input.
37	FM IN	I	FM counter input	Connect prescaler (TD6104P) output.
38	PSC	O	Prescaler control	Control selection of prescaler (TD6104P) 1/30 and 1/32 frequency division.
39	AM IN	I	AM counter input	AM local oscillator input.
40	INH	I	Inhibit input	Normal operation when at "H" level, inhibited status when at "L" level.
41	INT	I	Initialization input	Normal operation when at "H" level, initialization of internal status when at "L" level.
42	VDD	—	Power supply input terminal	Application of 5 ±0.5V. Back-up up to 2V possible.

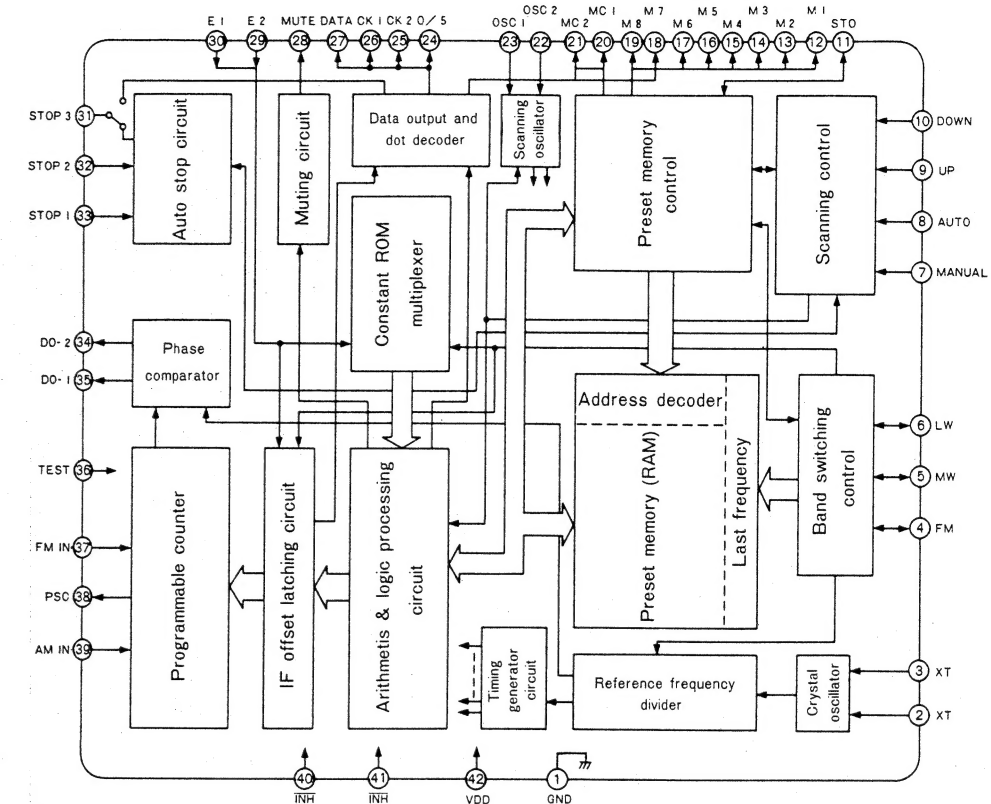
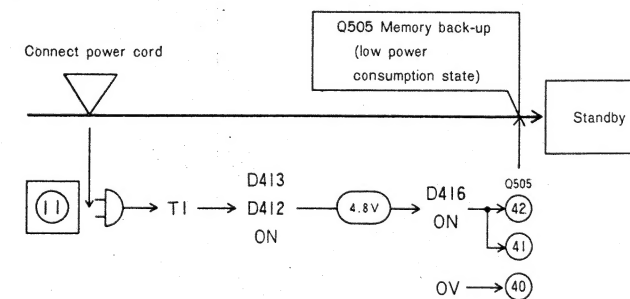


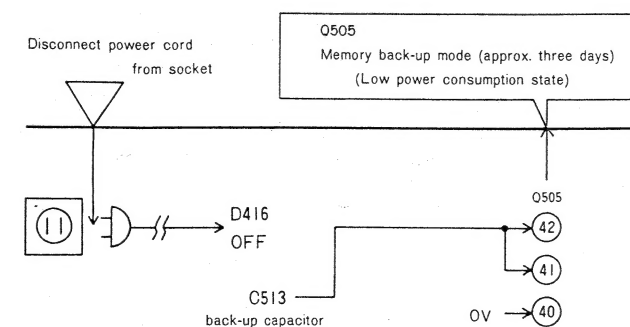
Fig. 7-1 TC9157P Block Diagram

### 7.2 OPERATION FLOWCHARTS

#### Connect power cord to mains socket (Fig. 7-2)



#### Disconnect power cord from mains socket (Fig. 7-2)



#### Power switch ON (1)

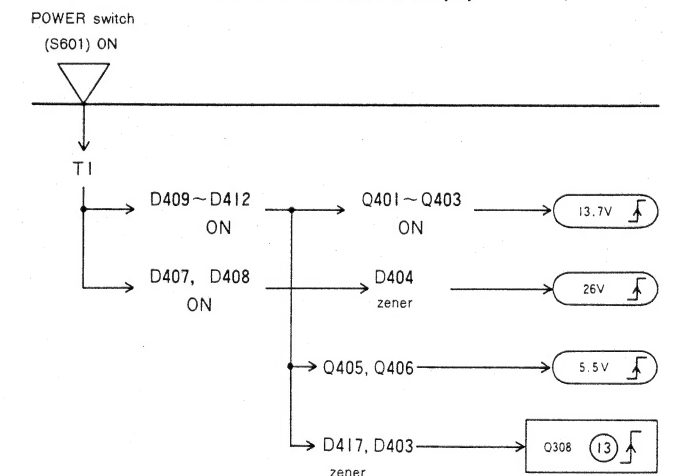


Fig. 7-2 Power Supply Circuit (1)

## Power switch ON (2)

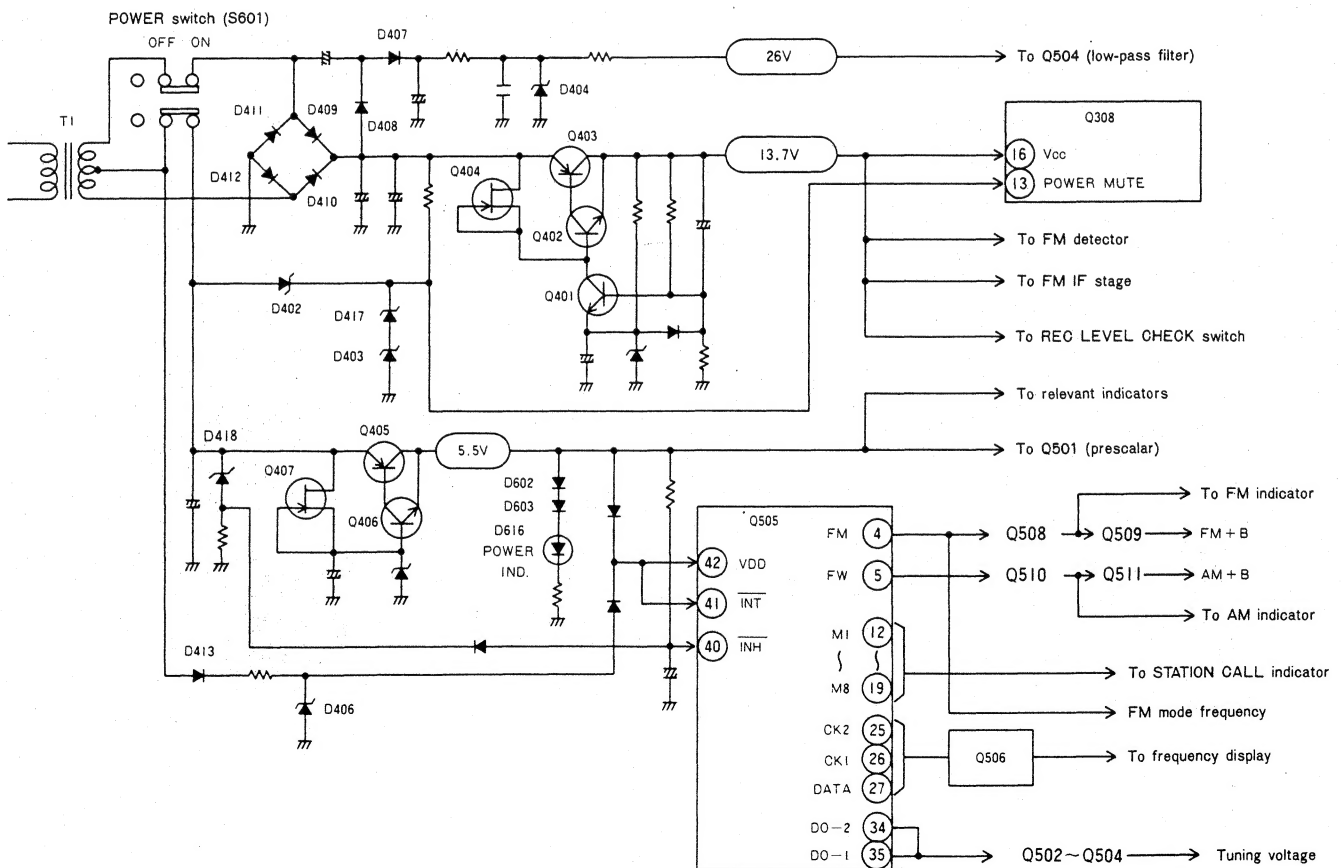
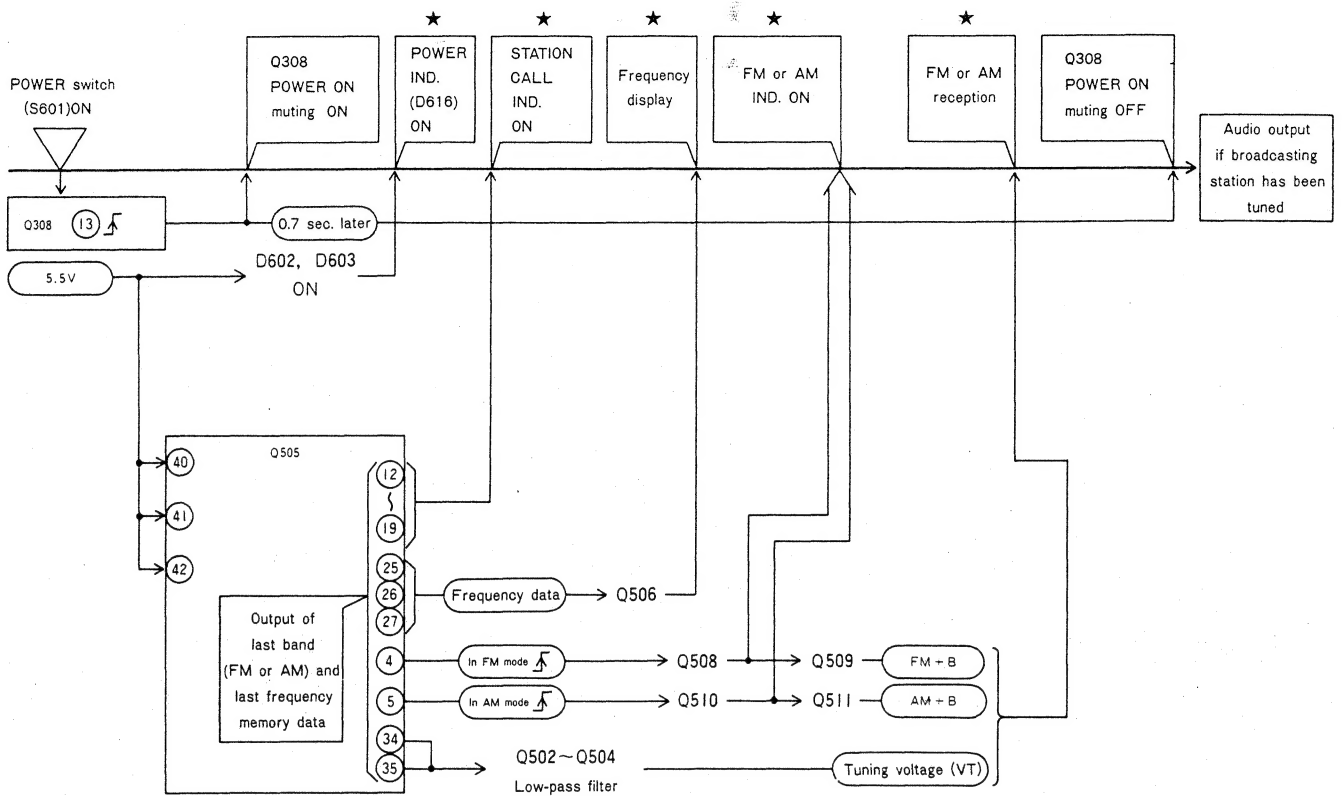


Fig. 7-3 Power Supply Circuit (2)



15

FM IF-BAND switch Operation (Fig. 7-5)

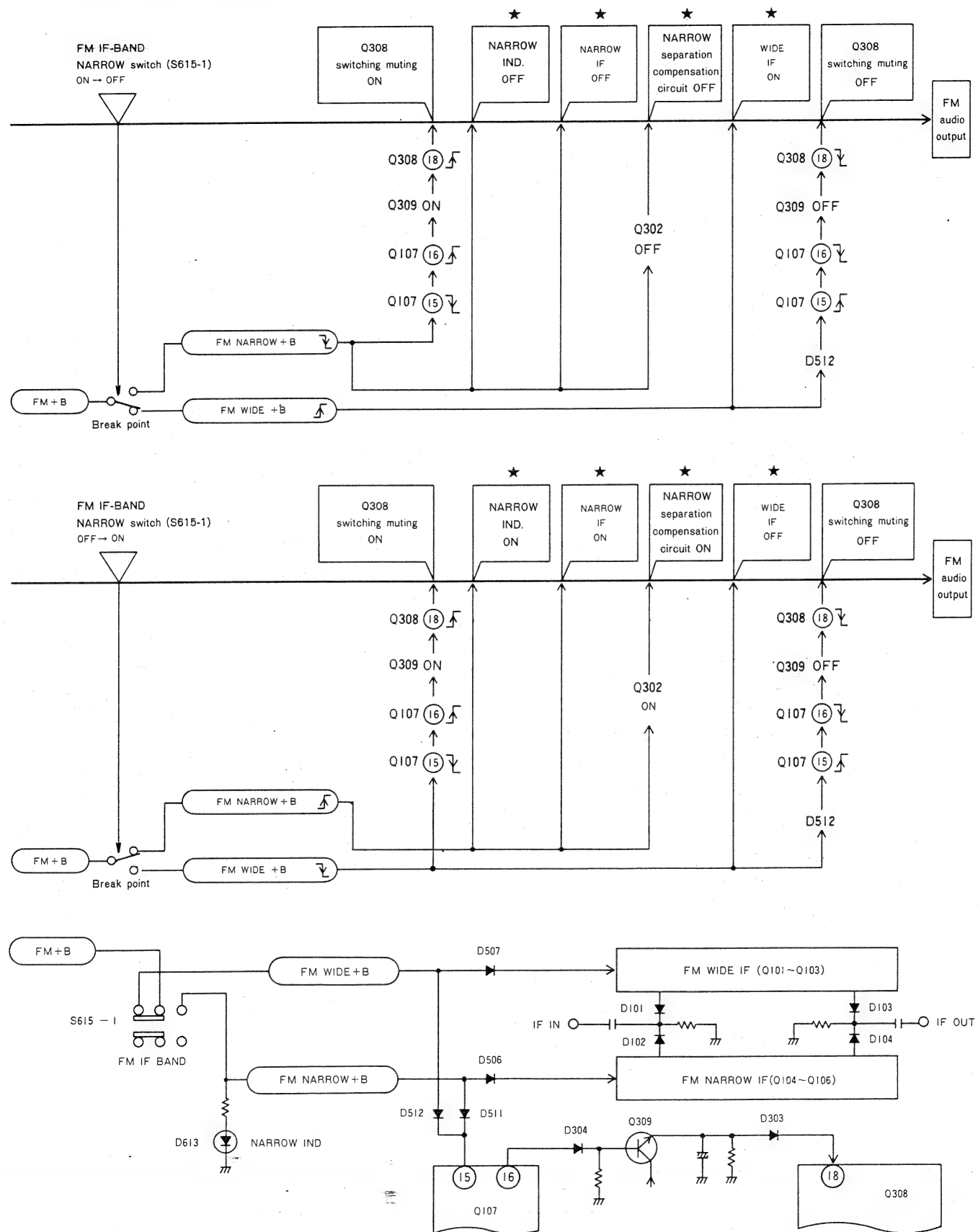


Fig. 7-5 FM IF-BAND Switching Circuit



REC LEVEL CHECK Switch Operation (Fig. 7-6)

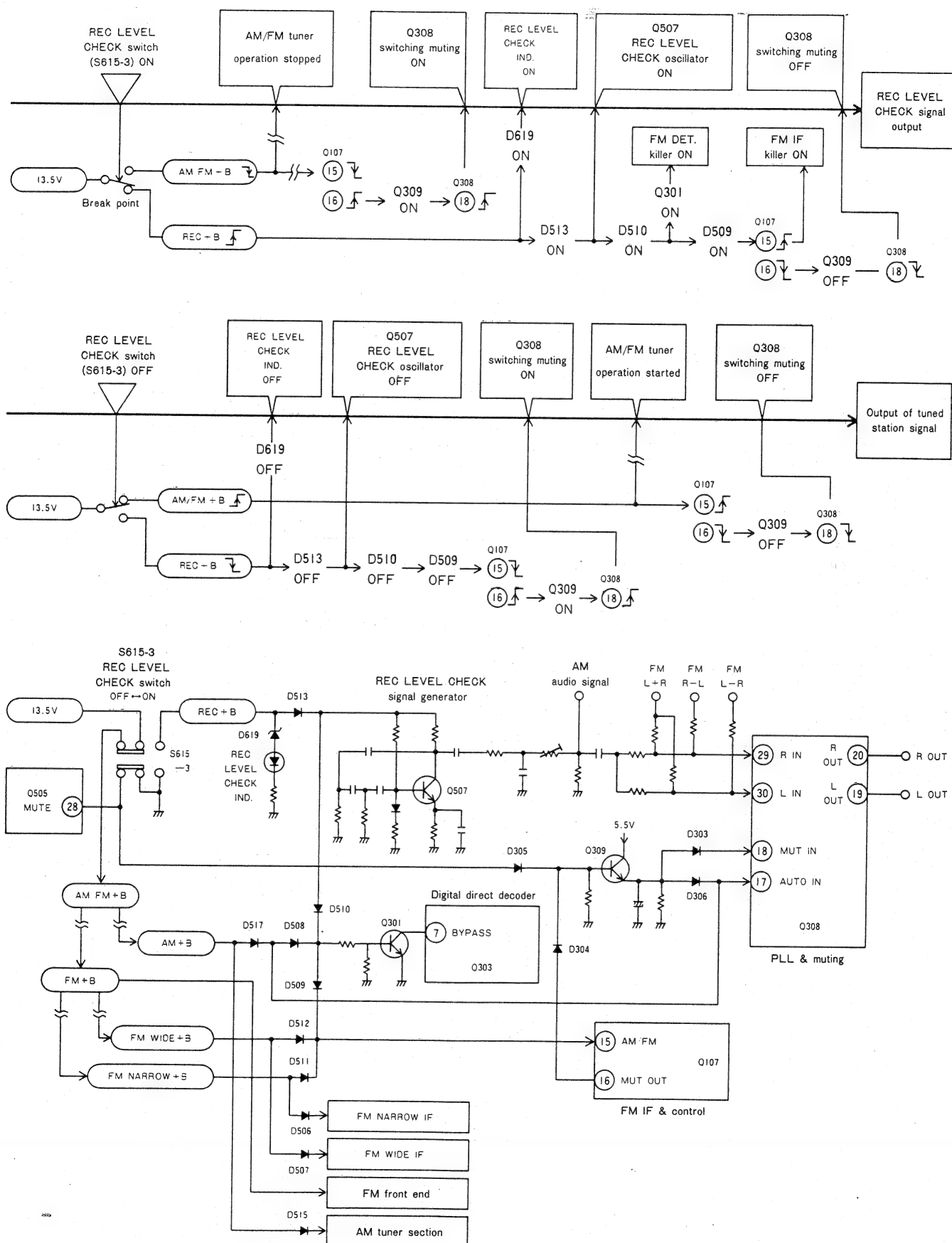


Fig. 7-6 REC LEVEL CHECK Switch Switching Circuit

# Frequency conversion (Fig. 7-7)

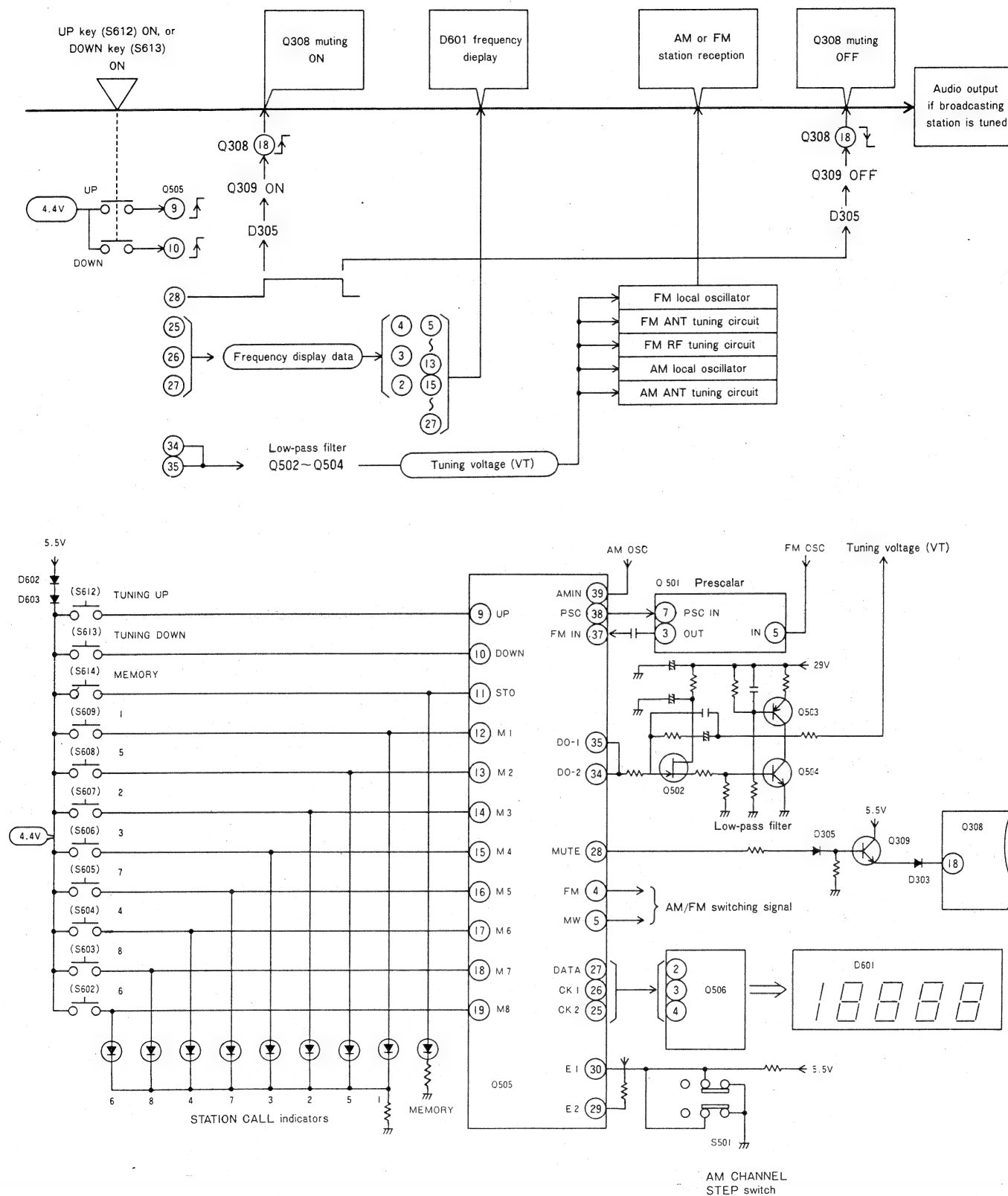
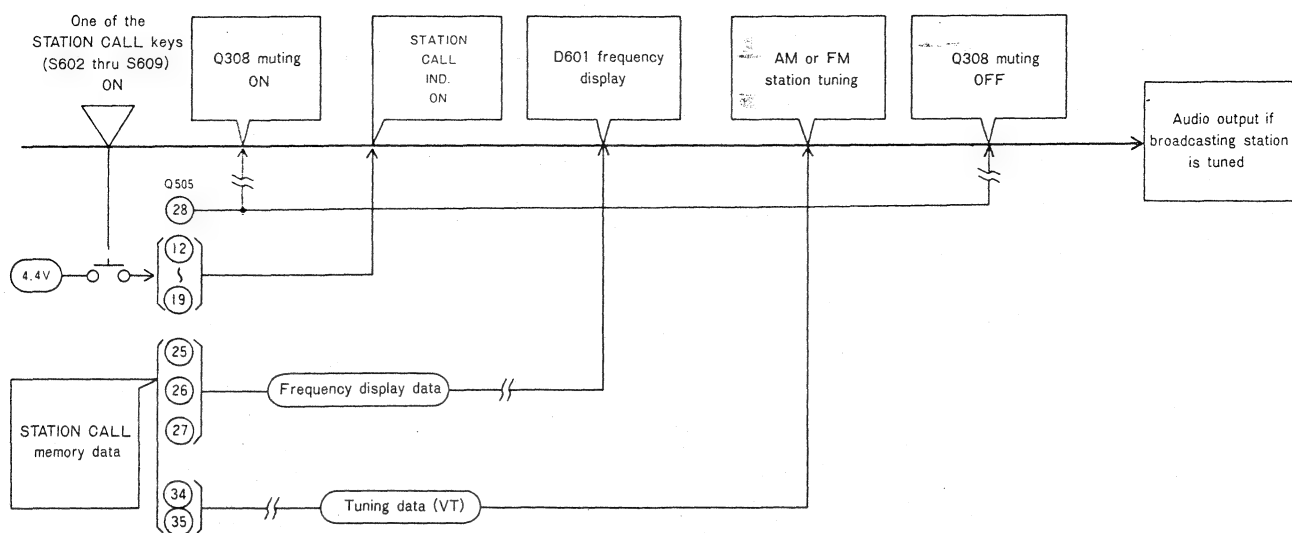
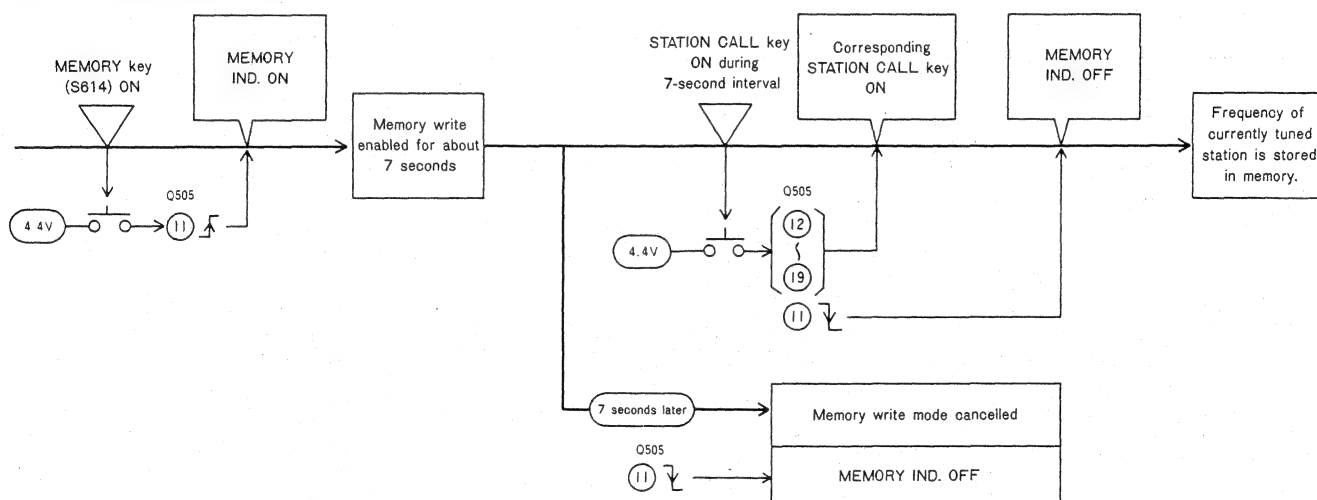


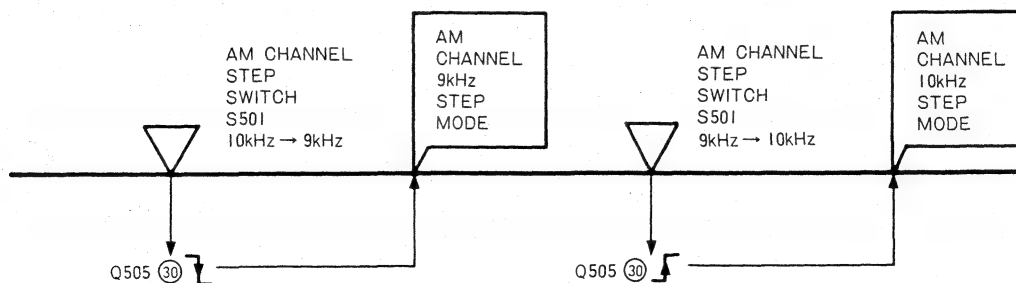
Fig. 7-7 Tuning Circuit



Memory operation (Fig. 7-7)



AM CHANNEL STEP Switch Operation (Fig. 7-7)



Indicator control (Fig. 7-8)

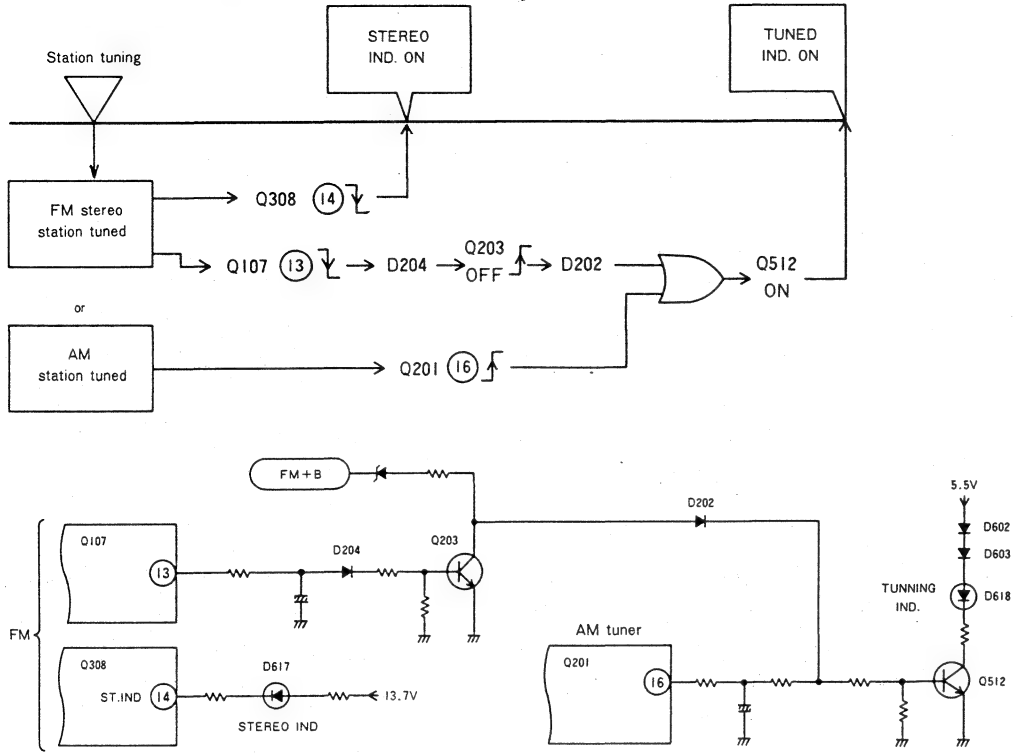


Fig. 7-8 Search mode switching circuit

Manual search / Mute off switch operation (Fig. 7-9)

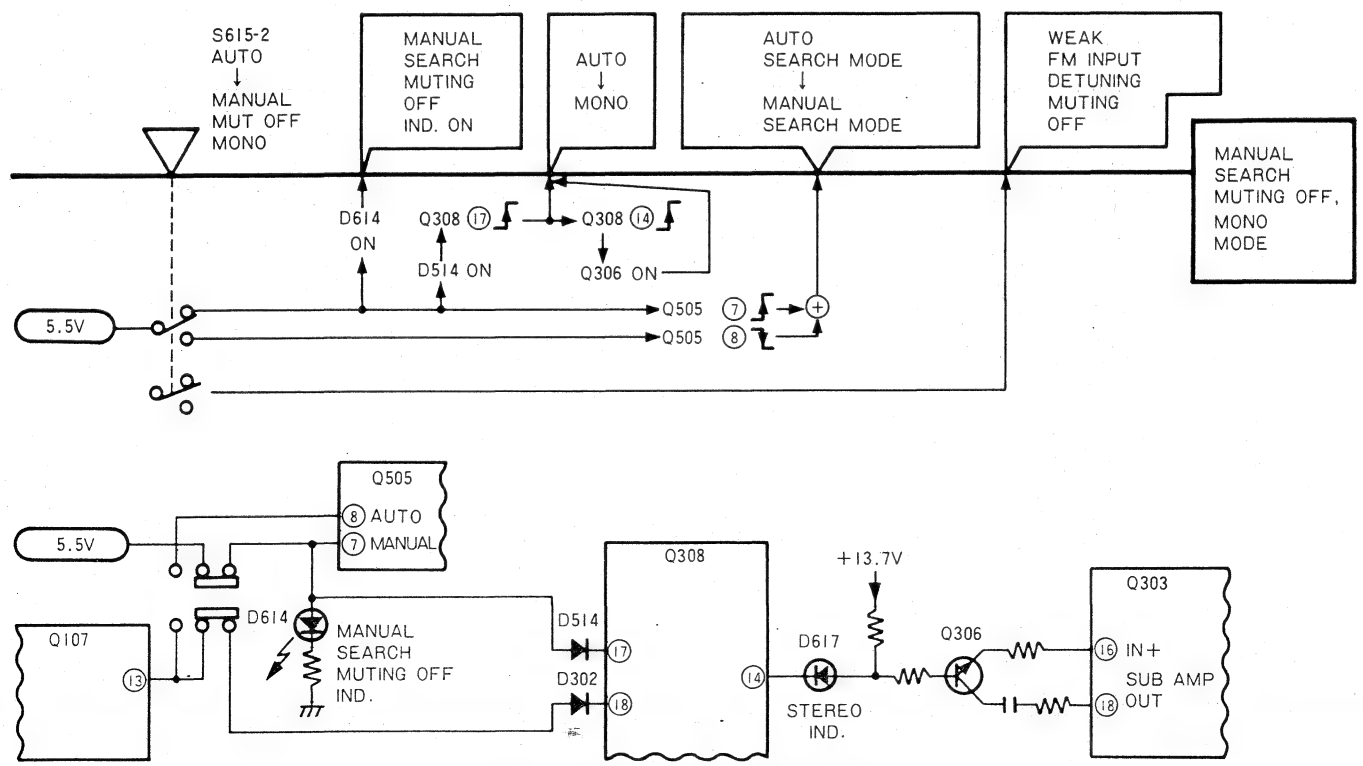


Fig. 7-9 Auto search switching circuit

FM auto search tuning (Fig. 7-10)

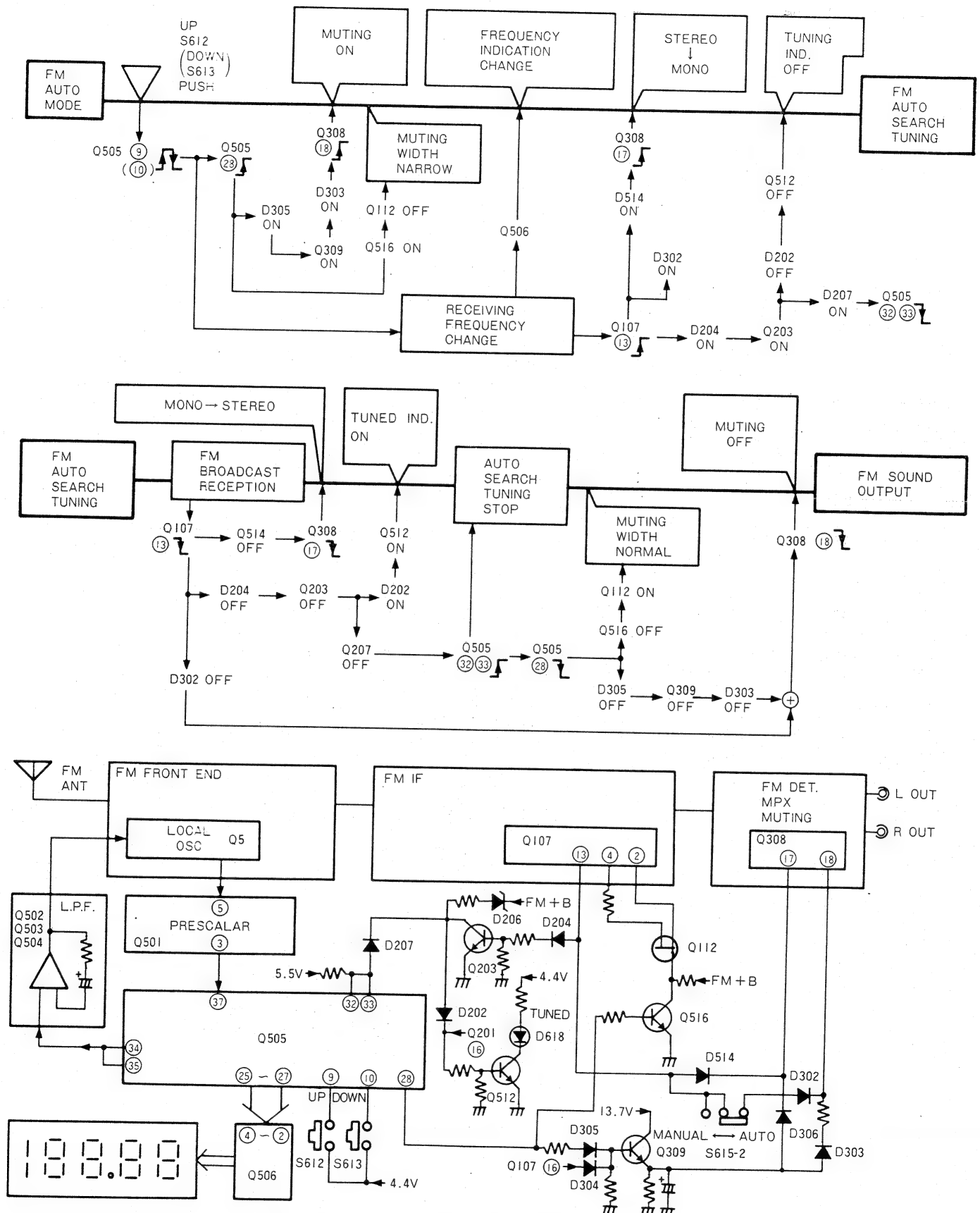


Fig. 7-10 FM auto search tuning circuit

AM auto search tuning (Fig. 7-11)

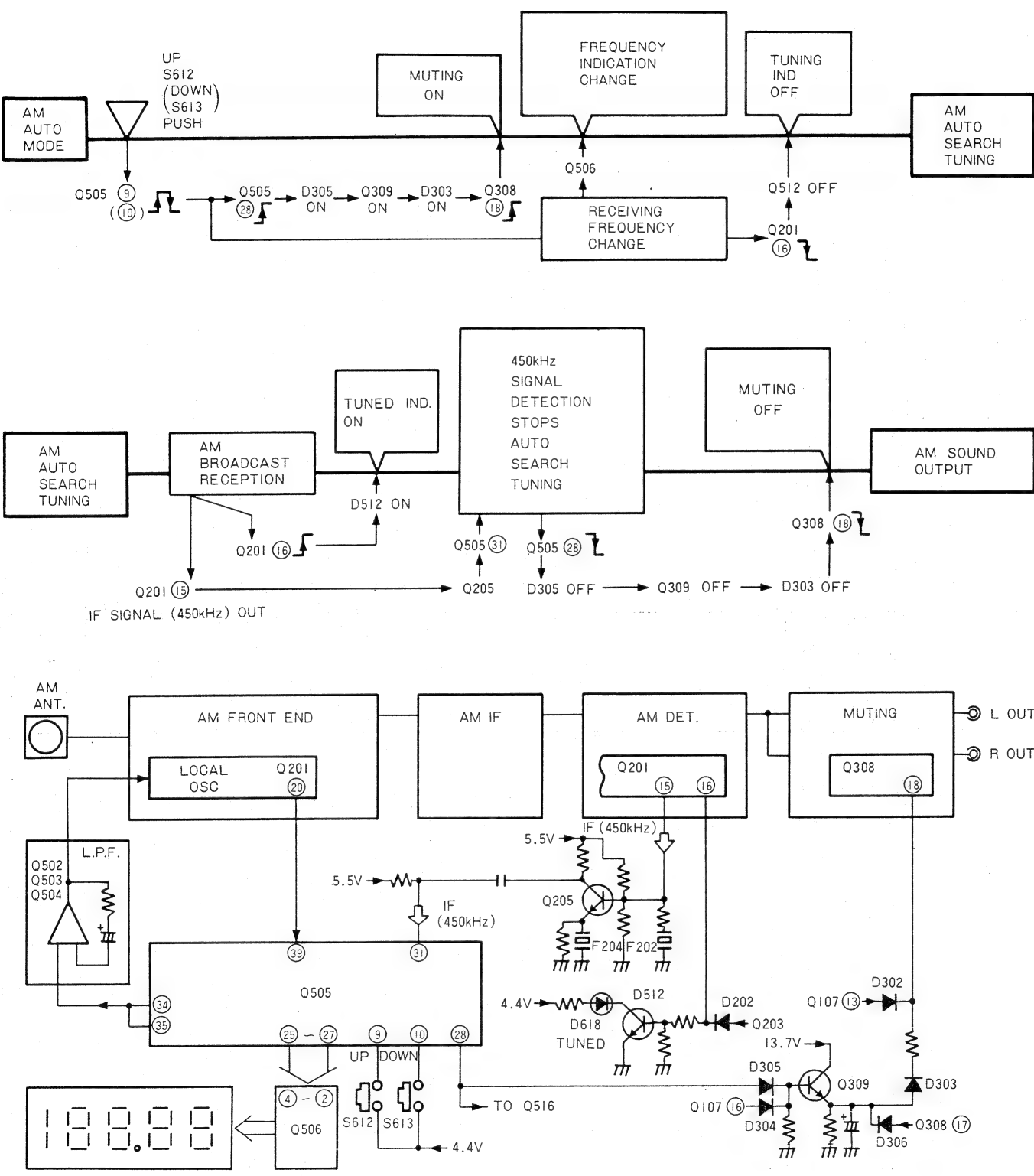


Fig. 7-11 AM auto search tuning circuit

### 7.3 OUTLINE OF SIGNAL PATH

#### Front End

In addition to conventional technology such as ID MOS FET, twin variable capacitors, and balance-hold capacitors, a recently developed source-injector type FET balanced mixer in the mixer stage has achieved a big improvement in the adjacent RF intermodulation characteristics. And a tracking coil inserted in the local oscillator stage corrects minor frequency discrepancies generated between the RF tuning stage and local oscillator, thereby reducing distortion in stereo reproduction.

#### IF Amplifier

This stage features a WIDE IF circuit for high quality reproduction, and a NARROW IF circuit for better selectivity, the two being switched by selector. The IF stage includes an IF system IC (PA3007).

#### Digital Direct Decoder

The digital direct decoder enables direct decoding of the MAIN (L+R) and SUB (L-R) signals.

The 10.7MHz IF signal with maximum frequency deviation of  $\pm 75\text{kHz}$  is doubled by Q110/Q111 to a frequency of 21.4MHz with maximum frequency deviation of  $\pm 150\text{kHz}$ . This signal is mixed with the output of the second local oscillator (20.14MHz crystal oscillator) to obtain the second IF signal of 1.26MHz and maximum frequency deviation of  $\pm 150\text{kHz}$ . This signal improves the decoding efficiency and obtains a high signal-to-noise ratio.

This second IF signal is applied to the digital direct decoder IC (PA5006). The MAIN signal is decoded in the same way pulse count decoding. That is, the second IF signal is adjusted to uniform amplitude by a limiter, and converted to trigger pulses by a differentiating circuit. This trigger pulse is then converted to a compressional wave pulse of constant amplitude and pulse width by a unistable multivibrator before being applied to the MAIN detector where the MAIN signal (L+R) is obtained. To obtain the SUB signal, the 19kHz pilot signal is removed from the above MAIN signal via an LC series resonator and subsequently applied to the PLL muting IC (PA5007). A 38kHz sinewave signal synchronized with the pilot signal is generated in this IC, and is passed back to PA5006 to be multiplied with the compression wave pulse for direct decoding of the SUB (L-R) signal. This SUB signal is applied to an inverting amplifier to obtain the R-L signal. Then by adding the respective L-R and R-L signals to the L+R MAIN signal, the L and R signals are obtained as indicated in the following equations.

$$(L+R) + (L-R) = 2L$$

$$(L+R) + (R-L) = 2R$$

Since these L and R signals contain various high region signals such as the subcarrier and second IF signal, these unwanted signal components are removed by a low-pass filter. The pilot signal is cancelled by an inverted phase pilot signal during the addition operation.

#### AM Tuner

Features two variable capacitors and an AM tuner IC (LA1247).

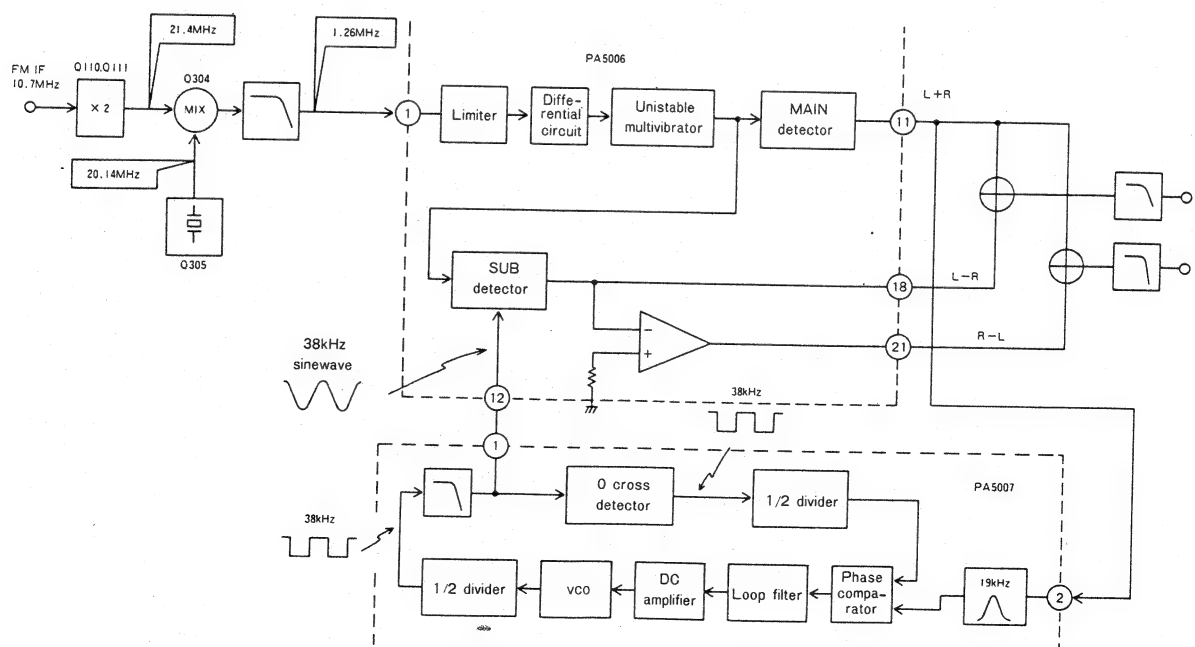


Fig. 7-12 Digital Direct Decoder



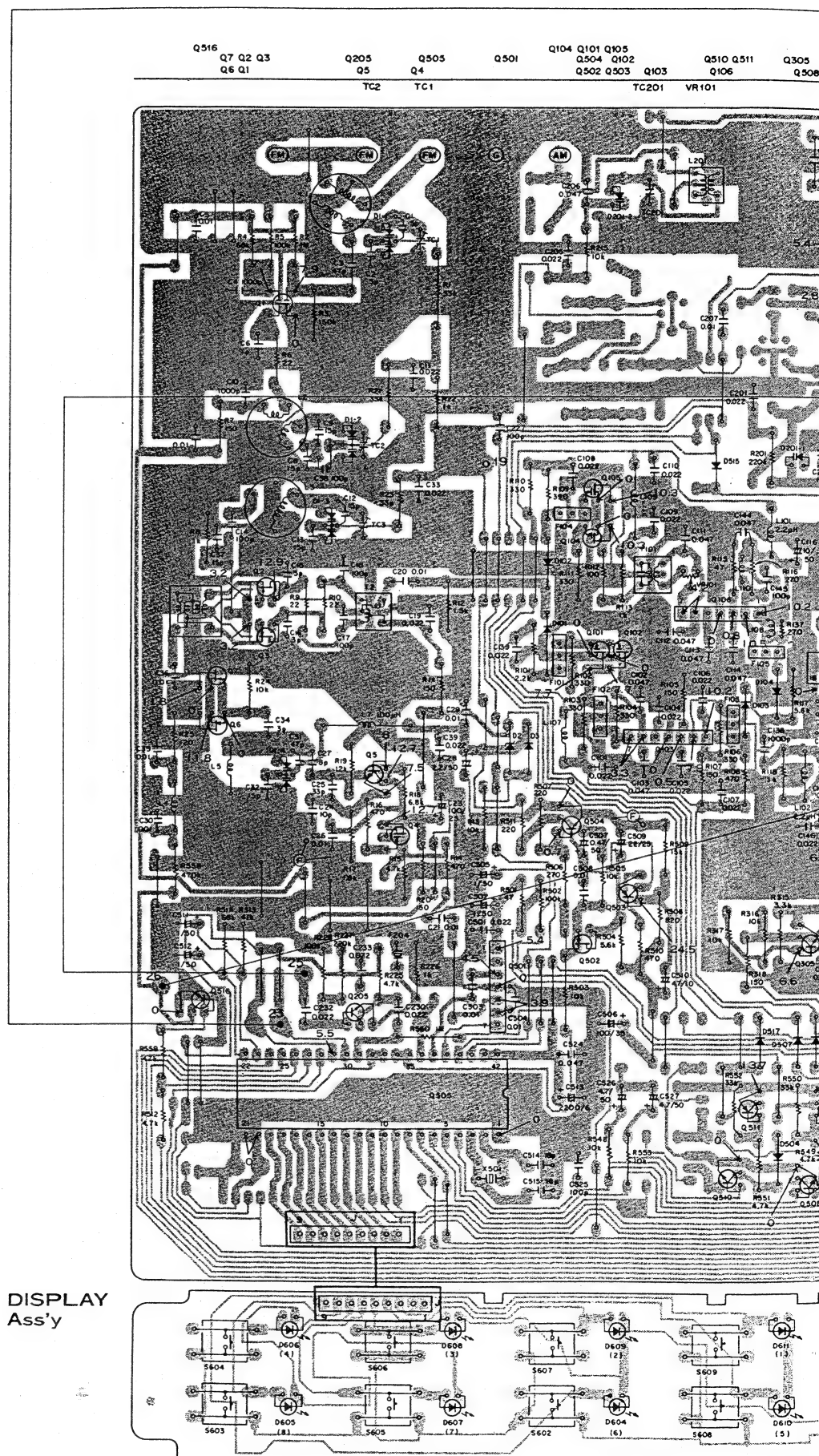
## 8. P.C.BOARD CONNECTION DIAGRAM

A

B

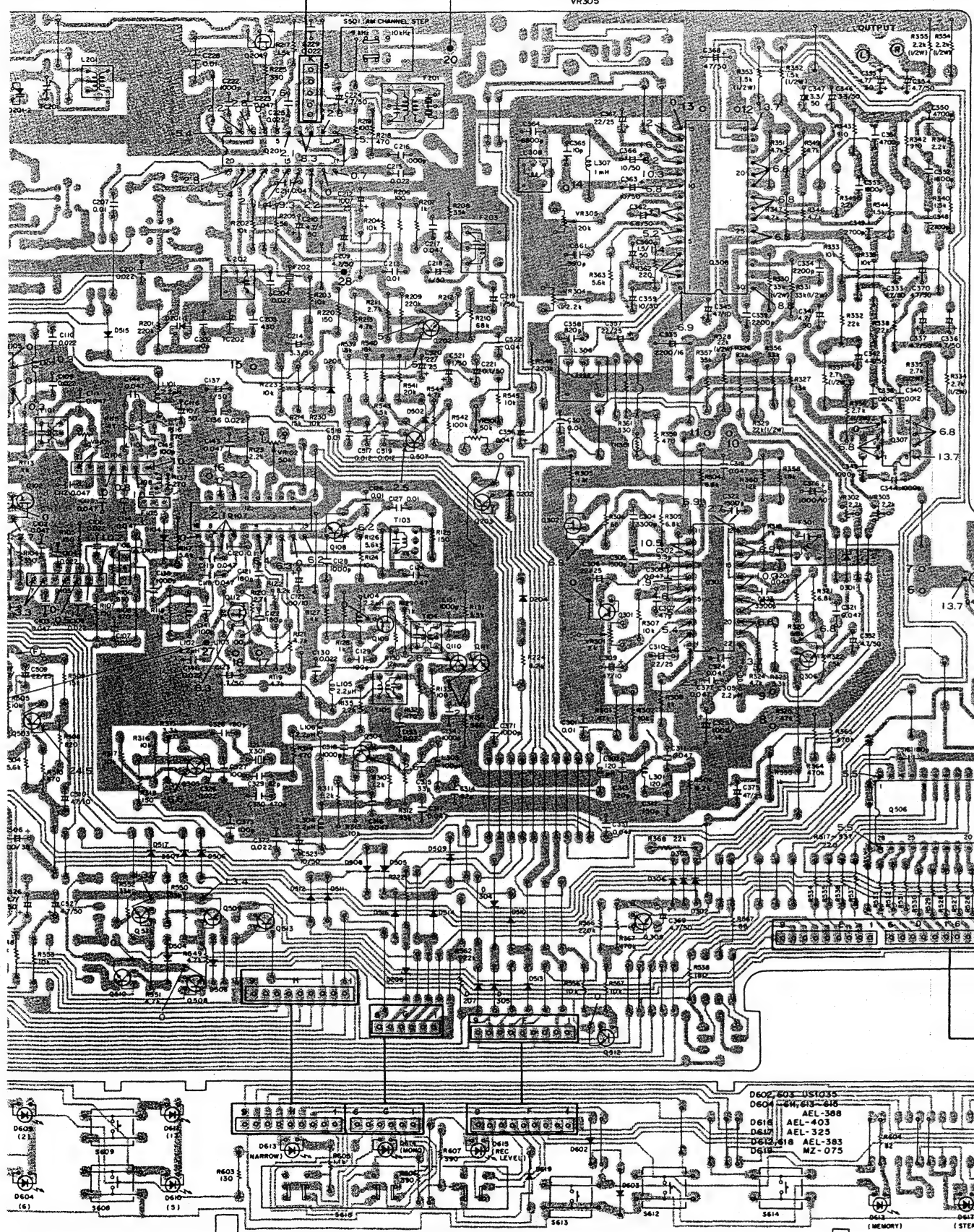
C

D



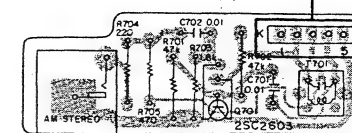
Q105 Q102 Q103 Q510 Q511 Q106 Q305 Q306 Q112 Q107 Q204 Q113 Q201 Q304 Q108 Q109 Q507 Q110 Q111 Q202 Q203 Q302 Q301 Q512 Q309 Q308 Q303 Q306 Q506 Q507 TC201 VR101 TC202 VR102 VR501 VR304 VR301 VR305 VR302 VR303

# TUNER Ass'y (GWE-210)



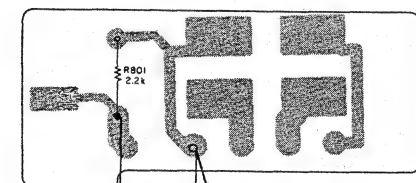
- Q1 P001
- Q2,3 2SK125
- Q103,106  $\mu$ PC1163H
- Q107 PA3007-A
- Q201 LA1247
- Q303 PA5006
- Q307 M5218P
- Q308 PA5007
- Q501 TD6104P
- Q505 TC9157P
- Q506 TD6301AP
- Q5,108,110,111 2SC1923
- Q6,7,109,4, 2SK241
- Q101,102,104,105 2SK241
- Q202,203,301,306,309, 2SC2603 or 2SC945A
- Q401,402,406, 2SC1923
- Q504,507,508,510,512,516 2SC2603 or 2SC945A
- Q204 2SK246
- Q304,305,205 2SC1923
- Q403,405 2S8834
- Q404,407 2SK246
- Q503,511 2SA1115 or 2SA733A
- Q509 2S8560
- Q302,502 2SK246
- Q513 2SD458
- D1 KVI320A-4
- D2,206 MZ-075
- D3,202,204,302~306,207 4A13~416,501~517,208 US1035
- D101~104 1S2076
- D201 KVI226-Y
- D301,402,403,417 KZL083
- D401,405 KZL081
- D404 MZ-290
- D406 MZ-048
- D407,408 10DF2FD
- D409~412 10DF2FD
- TH301 TH103-2
- D418 MZ-032

Q403 Q402 Q405 Q406 Q407 Q404 Q401

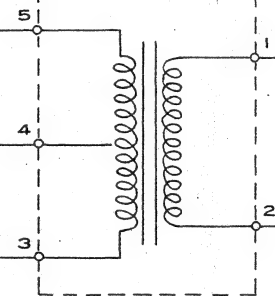


AM STEREO Ass'y

TERMINAL Ass'y



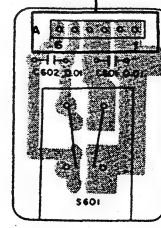
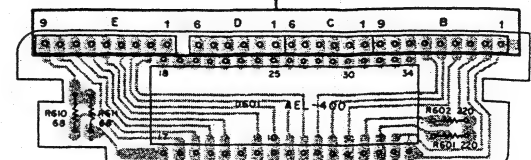
TI: POWER TRANSFORMER  
ATS-022



AC 120V  
60Hz

AC POWERCORD  
ADG-052

LED Ass'y



SWITCH Ass'y



## 6





## 10. ELECTRICAL PARTS LIST

## NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.  
Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).  
560Ω 56 × 10<sup>1</sup> 561..... RD%PS 560 J  
47kΩ 47 × 10<sup>3</sup> 473..... RD%PS 470 J  
0.5Ω 0R5 ..... RN2H 0R5 K  
1Ω 010 ..... RSIP 010 K  
Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).  
5.62kΩ 562 × 10<sup>1</sup> 5621..... RN%SR 562 F  
• The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.  
• For your Parts Stock Control, the fast moving items are indicated with the marks \*\*\* and \*.  
\*\*\* GENERALLY MOVES FASTER THAN \*  
This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

## Miscellaneous Parts

Mark	Part No.	Symbol & Description
	GWE-210	Tuner ass'y Switch ass'y LED ass'y Display ass'y AM stereo ass'y Power supply ass'y
$\Delta$ *	ATS-022	T1 Power transformer
$\Delta$ *	ADG-052	AC power cord

## Tuner Assembly (GWE-210)

## SEMICONDUCTORS

Mark	Part No.	Symbol & Description
***	PA5006	Q303
***	PA5007	Q308
***	TC9157P	Q505
***	2SK125	Q2, Q3
***	P001	Q1
***	M5218P	Q307
***	PA3007-A	Q107
***	(PA3007)	
***	$\mu$ PC1163H	Q103, Q106
***	LA1247	Q201
***	TD6104P	Q501
***	TD6301AP	Q506
***	2SK246	Q112
***	2SK241-Y	Q4, Q6, Q7, Q101, Q102, Q104, Q105, Q109
***	2SK246-Y	Q404, Q407
***	2SK246-GR	Q204, Q302, Q502
***	2SB560/A	Q509

Mark	Part No.	Symbol & Description
***	2SB834	Q403, Q405
***	2SA 1115 (2SA 733A)	Q503, Q511
***	2SD438/A	Q513
***	2SC2603	Q202, Q203, Q301, Q306, Q309 Q401, Q402, Q406, Q504, Q507, Q508, Q510, Q512, Q516
***	2SC1923	Q5, Q108, Q110, Q111, Q205, Q304, Q305
*	10DF2FD	D407 ~ D412
*	KZL 061	D401, D405
*	WZ-032	D418
*	WZ-290 (MZ-290)	D404
*	WZ-048	D406
*	MZ-075 (MZ-075)	D2, D206
*	KV1226-Y	D201
*	KV1320A-4	D1
*	KZL083	D301, D402, D403, D417
*	1S2076	D101 ~ D104
*	US1035 (1S1555)	D3, D202, D204, D207, D208, D302~D306, D413~D416, D501~D517

## SWITCH

Mark	Part No.	Symbol & Description
***	ASH-029	S501 Slide switch

## TRANSFORMERS, COIL AND FILTERS

Mark	Part No.	Symbol & Description
	ATB-073	L202 AM OSC coil
	ATB-087	L201 AM ANT coil
	ATC-203	L1 FM ANT coil
	ATC-204	L2 FM RF coil

Mark	Part No.	Symbol & Description
	ATC-205	L3 FM RF coil
	ATC-206	L5 FM OSC coil
	ATH-049	L108, L110 RF choke coil
	ATH-068	L305 Micro-inductor
	ATM-026	L308 38kHz coil
	ATM-027	L301 42kHz trap coil
	ATM-028	L306 19kHz coil
	T24-028	L7 RF choke coil
	ATH-049	L4, L101, L102, L104~L106, L109, L304 L103, L107, L303
	ATH-050	
	ATH-058	L307
	ATH-067	L301, L302
***	ATE-060	T103 FM DET transformer
***	ATE-061	T101, T104 FM IFT
***	ATE-062	T105 FM IFT
*	ATE-066	T2 FM IFT
*	ATX-026	T1 Balun transformer
	ATF-107	F101 FM ceramic filter
	ATF-118	F104 FM ceramic filter
	ATF-119	F102, F103 FM ceramic filter
	ATF-125	F202, F204 Ceramic resonator
	ATF-144	F203 20kHz filter
	ATF-138	F201 AM ceramic filter
	ATF-139	F105 FM IF filter
	ASS-025	X501 Crystal resonator
	ASS-026	X301 Crystal resonator

## CAPACITORS

Mark	Part No.	Symbol & Description
	ACE-070	C402 Styrol
	ACG-023	C361 Ceramic
	ACG-026	C317, C322, C316, C319~C321, C324, C331, C308 Ceramic
	CEXA 102M 16	C325, C376
	CQSA 222J 50	C334, C339
	CQSA 121J 50	C313
	CQSA 151J 50	C312
	CQSA 431J 50	C203
	CQSA 821J 50	C358
	CQSA 102J 50	C343, C344
	CQSA 152J 50	C305, C322
	CQSA 182J 50	C352, C353
	CQSA 272J 50	C348, C349
	CQSA 332J 50	C304, C323
	CQSA 472J 50	C350, C351
	CQSA 682J 50	C364
	CEANL 2R2M 50	C28
	CEANL R47M 50	C507
	CEA 221M 50L	C406
	CEA 471M 35L	C405
	CEA 102M 35L	C404
	CEA 222M 16L	C335
	CEA 222M 6L	C513
	CEXA 221M 50	C410

Mark	Part No.	Symbol & Description
	CCPCH 3R3K 50	C302
	CCPCH 470J 50	C3
	CKPYB 102K 50	C128
	CKPYX 103N 25	C228
	CEXA 470M 50	C368, C401, C403, C409
	CCDSL 101J 50	C227, C525, C145, C38, C14, C129, C327, C141, C373
	CCDSL 181J 50	C121, C122, C328, C516
	CCDCH 100D 50	C365, C24
	CCDCH 010C 50	C6
	CCDCH 030C 50	C15, C16, C34
	CCDTH 080D 50	C27
	CCDCH 150J 50	C37
	CCDCH 220J 50	C329
	CCDCH 330J 50	C25, C315
	CCDCH 470J 50	C307
	CCDCH 820J 50	C314
	CCDCH 180J 50	C514, C515
	CCDSH 050C 50	C1, C2
	CCDSH 150J 50	C8, C9, C12, C13, C32
	CCDRH 101J 50	C17, C18
	CCDSH 470J 50	C31
	CCDUJ 100D50	C202
	CEA 0R1M 50L	C221
	CEA 010M 50L	C137, C218, C219, C332, C502, C505, C511, C512, C521
	CEA 1R5M 50L	C360
	CEA 3R3M 50L	C346, C347, C214
	CEA 4R7M 50L	C123, C208, C210, C224, C333, C336, C337, C341, C342, C369, C370, C354, C355, C526, C527
	CEA 6R8M 50L	C362
	CEA 100M 50L	C116, C359, C3y3, C366, C523
	CEA 220M 25L	C306, C320, C357, C367, C411, C509, C520
	CEA 470M 10L	C345, C510, C309
	CEA 470M 25L	C375
	CEA 101M 10L	C125
	CEA 101M 25L	C23, C212
	CEA 101M 35L	C506
	CKDYB 471K 50	C330
	CKDYB 102K 50	C4, C10, C131, C134, C216, C222, C318, C138, C371
	CKDYF 103Z 50	C5, C7, C20, C26, C29, C30, C35, C36, C126, C127, C207, C213, C213, C301, C303, C503, C504, C21
	CKDYX 473M 25	C102, C103, C111~C114, C144, C377, C413
	CKDYF 223Z 50	C11, C19, C33, C39, C101, C104~C110, C146, C233, C229, C230, C232, C130, C133, C136, C201, C204, C205, C215, C225, C326, C501, C139, C372
	CKDYF 473Z 50	C118, C119, C124, C206, C211, C223, C143, C524

## 11. ADJUSTMENTS

## AM Section Adjustment

- Connect up as shown in Fig. 11-1.
- Press the AM key ON, and the REC LEVEL CHECK key OFF.
- Set the AM CHANNEL STEP switch to the 9kHz position (KU, S and S/G types).

Step	AM SG (400Hz, 30% modulation)		F-90 tuned frequency display	Adjustment	
	Frequency	Level		Adjustment location	Specifications
1	No signal		522kHz	L202	Adjust tuner ass'y TP19 to 2.0V DC.
2			1611 kHz	TC202	Adjust tuner ass'y TP19 to 24.5V DC.
3	Repeat steps 1 and 2 and ensure that both specifications are satisfied.				
4	603kHz	40 dB	603kHz	L201	Obtain maximum DC voltage reading at tuner ass'y TP15.
5	1395kHz	40 dB	1395kHz	TC201	
6	Repeat step 4 and 5 to obtain the maximum voltage at tuner ass'y TP15.				

## FM Section Adjustment

- Connect up as shown in Fig. 11-2.
- Press FM key ON, FM IF BAND NARROW key ON, and REC LEVEL CHECK key OFF. Then press MONO/MUTE/OFF key OFF.

Step	FM SG (400Hz, $\pm 75$ kHz dev.)		F-90 tuned frequency display	Adjustment	
	Frequency	Level		Adjustment location	Specifications
1	No signal		108.0 MHz	L5	Adjust tuner ass'y TP19 to 24.5V DC.
2			87.5 MHz		Check the tuner ass'y TP19 voltage (8.0V DC).
3	88.0 MHz	30 dB	88.0 MHz	L1, L2, L3, T2	Obtain maximum DC voltage reading at tuner ass'y TP16.
4	106.0 MHz	30 dB	106.0 MHz	TC1, TC2, TC3	
5	Repeat steps 3 and 4 to obtain the maximum voltage at TP16 on the tuner ass'y.				
6	Press FM IF-BAND NARROW key OFF, and rotate VR101 fully counter clockwise.				
7	98.0 MHz	30 dB	98.0 MHz	T101	Obtain maximum DC voltage reading at tuner ass'y TP16.
8	98.0 MHz	60 dB	98.0 MHz	T103	Adjust the voltage between TP17 and TP18 on the tuner ass'y to 0V.
9	98.0 MHz	60 dB	98.0 MHz	VR301	Adjust the voltage between TP10 and TP11 on the tuner ass'y to 0V.
10	98.0 MHz	40 dB approx.	98.0 MHz	VR101 (WIDE IF)	Press the FM IF-BAND NARROW key ON and OFF again, adjusting the WIDE and NARROW output level difference to $\pm 1.0$ dB.

Note: Adjust the FM SG output frequency accurately.

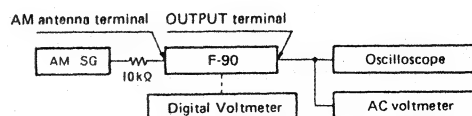


Fig. 11-1 AM Adjustment Connection Diagram

Mark	Part No.	Symbol & Description
	CKDYX 104M 25	C120
	CQMA 103J 50	C518, C508
	CQMA 123J 50	C338, C340, C517, C519
	CQMA 473J 50	C217, C356, C522
	ACM-018	TC1 ~ TC3 Ceramic trimmer
	ACM-019	TC201, TC202 Ceramic trimmer

## RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
*	TH103-2	TH301
*	RHS6BVS 222	VR302~VR304 Semi fixed
*	RHS6BVS 102	VR101 Semi fixed
*	RHB8AV 202	VR301 Semi fixed
*	RHB8AV 203	VR305 Semi fixed
*	RHB8AV 503	VR102, VR501 Semi fixed
	RN%PQ 0000 F	R363, R401, R402, R322~R324
	RD%PS 000 J	R406, R352~R355, R334~R337
	RD%PM 000 J	R328~R331
		Other resistors

## OTHERS

Mark	Part No.	Symbol & Description
	AKA-109	Terminal (ANTENNA)
	AKB-093	Terminal (OUTPUT)
	PBZ30P060FMC	Screw (3x6)

## Switch Assembly

## SWITCH

Mark	Part No.	Symbol & Description
$\Delta$ **	ASG-547	S601 Push switch

## CAPACITORS

Mark	Part No.	Symbol & Description
	CQMA 103J 50	C602
	ACE-097	C601 Styrol capacitor

## LED Assembly

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
*	AEL-423	D601 LED numeric display
	RD1/8 PM 000 J	R601, R602, R610, R611

## Display Assembly

## SEMICONDUCTORS

Mark	Part No.	Symbol & Description
*	MZ-075	D619
*	(WZ-075)	
*	US1035	D602, D603
*	(1S1555)	
*	AEL-388	D604~D611, D613~D615 LED
*	AEL-383	D612, D618 LED
*	AEL-325	D617 LED
*	AEL-403	D616 LED

## SWITCHES

Mark	Part No.	Symbol & Description
***	SEA8V222S	S615 Push switch
***	ASG-705	S602~S614 Tact switch

## RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
	RD%PM 000 J	R603~R609

## AM STEREO Assembly

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
*	ATB-091	T701 AM DET. transformer
*	AKB-097	Terminal (AM STEREO)
***	2SC2603	Q701
	CKDYF 103Z 50	C701, C702
	RD%PM 000 J	R702 ~ R705

## Power Supply Assembly

Mark	Part No.	Symbol & Description
	ACN-140	R801 Carbon composition resistor

## MPX Section Adjustment

- Connect up as shown in Fig. 11-3.
- Press FM key ON, FM IF-BAND NARROW key OFF (WIDE), MONO/MUTE OFF key ON, and REC LEVEL CHECK key OFF.
- Set FM SG modulation mode to EXT., and connect the MPX SG to the FM SG EXT. mode terminals.
- Adjust the FM SG output precisely to 98.0MHz, and the F-90 tuned frequency display to 98.0MHz.

Step No.	MPX SG Modulation Mode	MF SG Level	Adjustment	
			Adjustment Location	Specifications
1	Modulation output OFF	100dB	VR304	Adjust the tuner ass'y TP14 frequency to 38kHz $\pm 100$ Hz. Disconnect the frequency counter after completing this adjustment.
2	Pilot signal (19kHz) only	100dB	L306, VR305	Minimize the OUTPUT terminal 19kHz leak.
3	Standard stereo modulation	100dB	T2	Minimize OUTPUT terminal distortion.
4	Standard stereo modulation, and main signal in R.	100dB	VR302	Minimize the OUTPUT terminal left channel output.
5	Standard stereo modulation, and main signal in L.	100dB	VR303	Minimize the OUTPUT terminal right channel output.
6	Pilot signal (19kHz) only	100dB	VR305	Minimize the OUTPUT terminal 19kHz leak to the same level in both left and right channels.
7	Press the FM IF-BAND NARROW key ON			
8	Standard stereo modulation	26dB	VR102	Set to stage just prior to application of muting.

Note: Standard stereo modulation consists of main 1kHz (L+R)  $\pm 67.5$ kHz dev. and pilot (19kHz)  $\pm 7.5$ kHz dev.

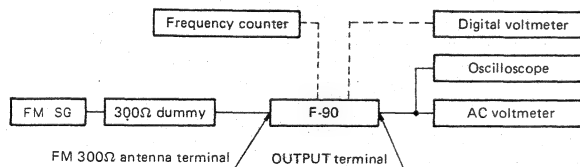


Fig. 11-2 FM Adjustment Connection Diagram

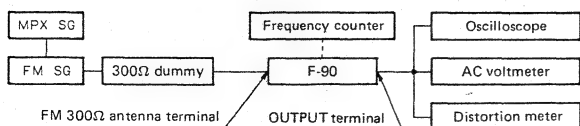


Fig. 11-3 FM MPX Adjustment Connection Diagram

## REC LEVEL CHECK Signal Generator Level Adjustment

- Connect up as shown in Fig. 11-2.
- Press the FM key ON, the FM IF-BAND NARROW key OFF (WIDE), the MONO/MUTE OFF key ON, and the REC LEVEL CHECK key OFF.

Step	FM SG (400Hz, $\pm 75$ kHz dev.)		F-90 Tuner Frequency Display	Adjustment	
	Frequency	Level		Adjustment Location	Specifications
1	98.0 MHz	80 dB	98.0 MHz		Check the OUTPUT terminal output level.
2	Press REC LEVEL CHECK key ON.			VR501	Set OUTPUT terminal output level to -6dB in respect to the step 1 level.

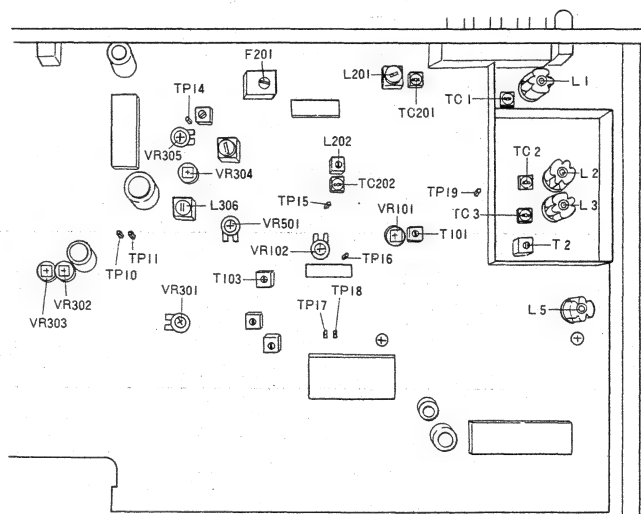


Fig. 11-4 Adjustment Locations

Adjustment Location	Adjustment Name
L1, TC1	FM ANT
L2, TC2 L3, TC3	FM RF
L5	FM OSC
T2	FM IFT
T101	FM WIDE IFT
T103	FM discrete
L306	Clean pilot
L201, TC201	AM ANT
L202, TC202	AM OSC
VR101	IF gain (WIDE)
VR102	MUTE level
VR301	V. center adjustment
VR302	Separation R $\rightarrow$ L
VR303	Separation L $\rightarrow$ R
VR501	REC LEVEL
VR304	VCO(38kHz)
VR305	Pilot cancel



## 11. RÉGLAGE

### Réglage de la partie AM (modulation d'amplitude)

- Effectuer les branchements comme indiqué sur la Fig. 11-1.
- Mettre le commutateur AM en position marche (ON), et le commutateur vérification de niveau d'enregistrement (REC LEVEL CHECK) en position arrêt (OFF).
- Placer le commutateur de sélection de canal AM (AM CHANNEL STEP) sur la position 9kHz (types KU, S et S/G).

Phase	Générateur de signal AM (400Hz, modulation 30%)		Affichage de la fréquence d'ac- cord du F-90	Réglage	
	Fréquence	Niveau		Position du réglage	Caractéristiques
1	Pas se signal		522kHz	L202	Régler l'élément tuner TP19 sur 2,0V CC.
2			1611kHz	TC202	Régler l'élément tuner TP19 sur 24,5V CC.
3	Se remettre sur les phase 1 et 2 et s'assure que les 2 caractéristiques sont remplies. lies.				
4	603kHz	40dB	603kHz	L201	Obtenir une lecture maximale de la tension CC au niveau de l'élément tuner TP15.
5	1395kHz	40dB	1395kHz	TC201	
6	Se remettre sur les phase 4 et 5 afin d'obtenir une tension maximale au niveau de l'élément tuner TP15.				

### Réglage de la partie FM

- Effectuer les branchements comme indiqué sur la Fig. 11-2.
- Mettre le commutateur FM en position marche (ON), le commutateur de limitation de fréquences moyennes FM (FM IF BAND NARROW) en position marche (ON), et le commutateur de vérification de niveau d'enregistrement (REC LEVEL CHECK) sur arrêt. Puis, placer les commutateurs MONO/SILENCIEUX/ARRET (MONO/MUTE/OFF) sur arrêt (OFF).

Phase	Générateur de signal FM (400Hz, déviation ±75kHz)		Affichage de la fréquence d'accord du F-90	Réglage	
	Fréquence	Niveau		Position du réglage	Caractéristiques
1	Pas de signal		108,0MHz	L5	Régler l'élément tuner TP19 sur 24,5V CC.
2			87,5MHz	—	Vérifier la tension de l'élément tuner TP19 (8,0V CC).
3	88,0MHz	30dB	88,0MHz	L1,L2,L3,T2	Obtenir une lecture maximale de la tension CC au niveau de l'élément tuner TP16.
4	106,0MHz	30dB	106,0MHz	TC1,TC2,TC3	
5	Se remettre sur les phase 3 et 4 afin d'obtenir une tension maximale au niveau de l'élément tuner TP16.				
6	Mettre le commutateur de limitation de fréquences moyennes FM (FM IF-BAND NARROW) en position arrêt (OFF) et faire pivoter le VR101 complètement dans le sens des aiguilles d'une montre.				
7	98,0MHz	30dB	98,0MHz	T101	Obtenir une lecture maximale de la tension CC au niveau de l'élément tuner TP16.
8	98,0MHz	60dB	98,0MHz	T103	Régler la tension entre TP10 et TP18 sur le tuner sur 0V.
9	98,0MHz	60dB	98,0MHz	VR301	Régler la tension entre TP10 et TP11 sur tuner sur 0V.
10	98,0MHz	40dB approx.	98,0MHz	VR101 (WIDE IF)	Placer le commutateur de limitation de fréquences moyennes FM (FM IF-BAND NARROW) sur marche (ON) et sur arrêt (OFF) plusieurs fois, et régler la différence de niveau de sortie LARGE/ETROITE (WIDE/NARROW) à ±1,0dB.

Remarque : Régler la fréquence de sortie du générateur de fréquence FM avec précision.

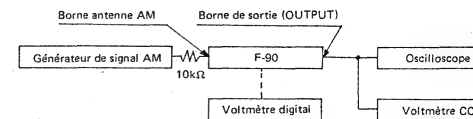


Fig. 11-1 Schéma de branchement pour le réglage AM

### Réglage de la partie MULTIPLEX

- Effectuer les branchements comme indiqué sur la Fig. 11-3.
- Placer le commutateur de modulation de fréquence (FM) sur marche (ON), le commutateur de limitation de fréquences moyennes FM (FM IF-BAND NARROW) sur arrêt, le commutateur MONO/SILENCIEUX/ARRET (MONO/MUTE/OFF) sur marche, et le commutateur de vérification de niveau d'enregistrement (REC LEVEL CHECK) sur arrêt.
- Placer le sélecteur de modulation du générateur de signal FM (FM SG) sur EXT, et brancher le générateur de signal multiplex (MPX SG) sur les bornes EXT du générateur de signal FM.
- Régler la sortie du générateur de signal FM précisément sur 98,0MHz, et l'affichage de la fréquence d'accord du F-90 sur 98,0MHz.

Phase N°	Mode de modulation du générateur de signal multiplex	Niveau du générateur de signal FM	Réglage	
			Position du réglage	Caractéristiques
1	Sortie de modulation sur arrêt (OFF).	100dB	VR304	Régler la fréquence de l'élément tuner TP14 sur 38kHz $\pm 100$ Hz. Débrancher le fréquence-mètre après avoir terminé ce réglage.
2	Signal pilote (19kHz) uniquement.	100dB	L306,VR305	Réduire au minimum les fuites 19kHz au niveau de la borne de sortie (OUTPUT).
3	Modulation stéréo standard.	100dB	T2	Réduire au minimum la distortion au niveau de la borne de sortie (OUTPUT).
4	Modulation stéréo standard, le signal principal sur le canal droit (R).	100dB	VR302	Réduire au minimum le niveau de sortie du canal gauche au niveau de la borne de sortie (OUTPUT).
5	Modulation stéréo standard, le signal principal sur le canal gauche (L).	100dB	VR303	Réduire au minimum le niveau de sortie du canal droit au niveau de la borne de sortie (OUTPUT).
6	Signal pilote uniquement (19kHz).	100dB	VR305	Réduire au minimum les fuites 19kHz au même niveau sur les canaux droit et gauche.
7	Placer le commutateur de limitation de fréquences moyennes FM (FM IF-BAND NARROW) sur marche (ON).			
8	Modulation stéréo standard.	26dB	VR102	Juste avant d'utilisation du silencieux, régler l'appareil sur la position convenable.

Remarque : La modulation stéréo standard se compose d'un signal principal de 1kHz canal droit + canal gauche (L+R) d'une déviation de  $\pm 67,5$ kHz, et d'un signal pilote (19kHz) d'une déviation de  $\pm 7,5$ kHz.

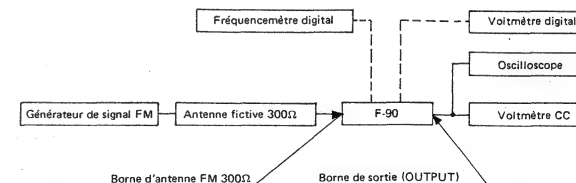


Fig. 11-2 Schéma de branchement pour le réglage multiplex



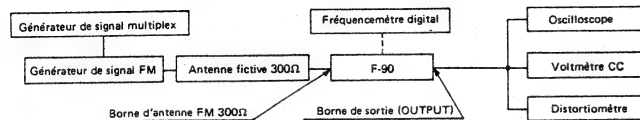


Fig. 11-3 Schéma de branchement pour le réglage FM multiplex

### Réglage du niveau du générateur de signal pour vérifier le niveau d'enregistrement (REC LEVEL CHECK)

- Effectuer les branchements comme indiqué sur la Fig. 11-2.
- Placer le commutateur FM en position marche (ON), le commutateur de limitation de fréquences moyennes FM (FM IF-BAND NARROW) en position arrêt (LARGE) (OFF WIDE), le commutateur MONO/SILENCIEUX/ARRET (MONO/MUTE/OFF) en position marche (ON), et le commutateur de vérification de niveau d'enregistrement (REC LEVEL CHECK) en position arrêt (OFF).

Phase	Générateur de signal FM (400Hz, déviation de $\pm 75$ kHz)		Affichage de la fréquence du tuner F-90	Réglage	
	Fréquence	Niveau		Position du réglage	Caractéristiques
1	98,0MHz	80dB	98,0MHz	—	Vérifier le niveau de la borne de sortie (OUTPUT).
2	Placer le commutateur de vérification de niveau d'enregistrement (REC LEVEL CHECK) en position arrêt (OFF).			VR501	Régler le niveau de la borne de sortie (OUTPUT) à -6dB en tenant compte du niveau de la phase 1.

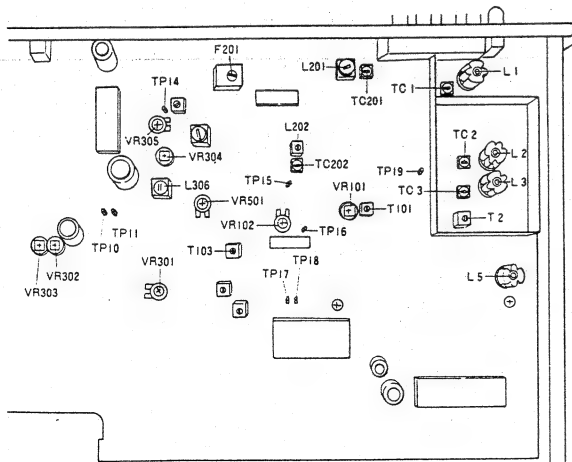


Fig. 11-4 Positions des réglages

Position du réglage	Désignation du réglage
L1, TC1	FM ANT
L2, TC2 L3, TC3	FM RF
L5	FM OSC
T2	FM IFT
T101	FM WIDE IFT
T103	FM discret (FM discrete)
L306	Atténuation du signal pilote (Clean pilot)
L201, TC201	AM ANT
L202, TC202	AM OSC
VR101	Gain fréquences moyennes (LARGE) (IF gain WIDE)
VR102	Niveau du silencieux (MUTE LEVEL)
VR301	Réglage centre V
VR302	Séparation Droite/gauche (R/L)
VR303	Séparation Gauche/droite (L/R)
VR501	Niveau d'enregistrement (REC LEVEL)
VR304	VCO (38kHz)
VR305	Élimination du signal pilote

## 11. AJUSTE

### Ajuste de la section de AM

- Conectar como se muestra en la Fig. 11-1.
- Presionar la tecla AM a ON y la tecla REC LEVEL CHECK a OFF.
- Poner el selector AM CHANNEL STEP en la posición de 9kHz (tipos KU, S y S/G).

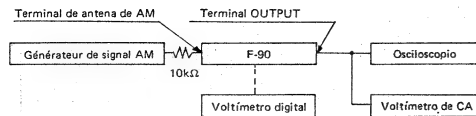
Paso	Generador de señales de AM (400Hz, modulación del 30%)		Frecuencímetro del sintonizador F-90	Ajustes	
	Frecuencia	Nivel		Lugar de ajuste	Especificaciones
1	Sin señal		522kHz	L202	Ajustar el conjunto sintonizador TP19 a 2V CC.
2			1611kHz	TC202	Ajustar el conjunto sintonizador TP19 a 24,5V CC.
3	Repetir los pasos 1 y 2 y cerciorarse de que se satisfacen ambas especificaciones.				
4	603kHz	40dB	603kHz	L201	Para obtener la indicación de tensión de CC máxima en TP15 del conjunto sintonizador.
5	1395kHz	40dB	1395kHz	TC201	
6	Repetir los pasos 4 y 5 para obtener la tensión máxima en TP15 del conjunto sintonizador.				

### Ajuste de la sección de FM

- Conectar como se muestra en la Fig. 11-2.
- Presionar la tecla FM a ON, FM IF BAND NARROW a ON y la REC LEVEL CHECK a OFF. Luego, presionar la tecla MONO/MUTE/OFF a OFF.

Paso	Generador de señales de FM (400Hz, $\pm 75\text{kHz}$ de desv.)		Frecuencímetro del sintonizador F-90	Ajustes	
	Frecuencia	Nivel		Lugar de ajuste	Especificaciones
1	Sin señal		108,0MHz	L5	Ajustar TP19 del conjunto sintonizador a 24,5V CC.
2			87,5MHz	—	Comprobar la tensión de TP19 del conjunto sintonizador (8V CC).
3	88,0MHz	30dB	88,0MHz	L1,L2,L3,T2	Obtener la indicación de tensión de CC máxima en TP16 del conjunto sintonizador.
4	106,0MHz	30dB	106,0MHz	TC1,TC2,TC3	
5	Repetir los pasos 3 y 4 para obtener la tensión máxima en TP16 del conjunto sintonizador.				
6	Presionar la tecla FM IF-BAND NARROW a OFF, y girar VR101 completamente hacia la izquierda.				
7	98,0MHz	30dB	98,0MHz	T101	Obtener la indicación de la tensión de CC máxima en TP16 del conjunto sintonizador.
8	98,0MHz	60dB	98,0MHz	T103	Ajustar la tensión entre TP17 y TP18 del conjunto sintonizador a 0V.
9	98,0MHz	60dB	98,0MHz	VR301	Ajustar la tensión entre TP10 y TP11 del conjunto sintonizador a 0V.
10	98,0MHz	40dB aprox.	98,0MHz	VR101 (WIDE IF)	Presionar la tecla FM IF-BAND NARROW a ON y luego otra vez a OFF, ajustando la diferencia del nivel de salida de WIDE y de NARROW a $\pm 1\text{dB}$ .

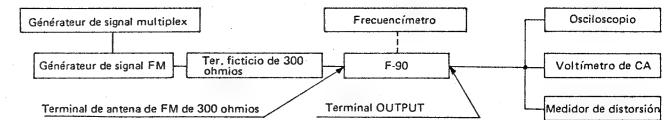
*Nota: Ajustar con precisión la frecuencia de salida del generador de señales de FM.*



**Fig. 11-1 Diagrama de conexiones para ajuste de AM**

### Ajuste de la sección de MPX

- Conectar como se muestra en la Fig. 11-3.
- Presionar la tecla FM a ON, la tecla FM IF-BAND NARROW a OFF (WIDE), la tecla MONO/MUTE OFF a ON, y la tecla REC LEVEL CHECK a OFF.
- Ajustar el modo de modulación del generador de señales de FM a EXT. y conectar el MPX SG (generador de señales de multiplex) a los terminales de modo FM SG EXT.
- Ajustar la salida del generador de señales de FM a 98,0MHz, y el frecuencímetro sintonizado de F-90 a 98,0MHz.



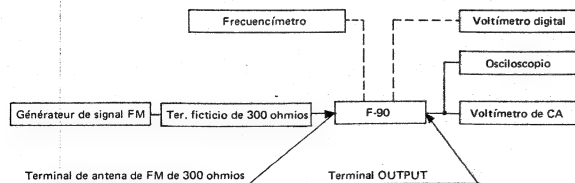
**Fig. 11-3** Diagrama de conexiones para ajuste de FM MPX

### Ajuste del nivel del generador de señales en REC LEVEL CHECK

- Conectar como se muestra en la Fig. 11-2.
- Presionar la tecla FM a ON, la tecla FM IF-BAND NARROW a OFF (WIDE), la tecla MONO/MUTE OFF a ON, y la tecla REC LEVEL CHECK a OFF.

No de paso	Modo de modulación del MPX SG	Nivel del FM SG	Lugar de ajuste	Ajuste
				Especificaciones
1	Salida de modulación OFF.	100dB	VR304	Ajustar la frecuencia de TP14 del conjunto sintonizador a 38kHz $\pm$ 100Hz. Desconectar el frecuencímetro después de haber completado este ajuste.
2	Señal piloto (19kHz) solamente.	100dB	L306,VR305	Minimizar la pérdida de 19kHz del terminal OUTPUT.
3	Modulación estereofónica estándar.	100dB	T2	Minimizar la distorsión en el terminal OUTPUT.
4	Modulación estereofónica estándar, y señal principal en R.	100dB	VR302	Minimizar la salida del canal izquierdo en el terminal OUTPUT.
5	Modulación estereofónica estándar, y señal principal en L.	100dB	VR303	Minimizar la salida del canal derecho en el terminal OUTPUT.
6	Señal piloto (19kHz) solamente.	100dB	VR305	Minimizar la pérdida de 19kHz del terminal OUTPUT al mismo nivel en los canales izquierdo y derecho.
7	Presionar la tecla FM IF-BAND NARROW a ON.			
8	Modulación estereofónica estándar.	26dB	VR102	Ajustar a la etapa precisamente antes de aplicar el silenciamiento.

*Nota: La modulación estereofónica estándar consta de la principal de 1kHz (L+R)  $\pm 67,5$ kHz de desv. y de la piloto (19kHz)  $\pm 7,5$ kHz de desv.*



**Fig. 11-2 Diagrama de conexiones para ajuste de FM**

Paso	Generador de señales de FM (400Hz, $\pm 75$ kHz desv.)		Frecuencí- metro del sinto- nizador F-90	Ajuste	
	Frecuencia	Nivel		Lugar de ajuste	Especificaciones
1	98,0MHz	80dB	98,0MHz	—	Comprobar el nivel de salida del terminal OUTPUT.
2	Presionar la tecla REC LEVEL CHECK a ON.			VR501	Ajustar el nivel de salida del terminal OUTPUT a -6dB con respecto al nivel del paso 1.

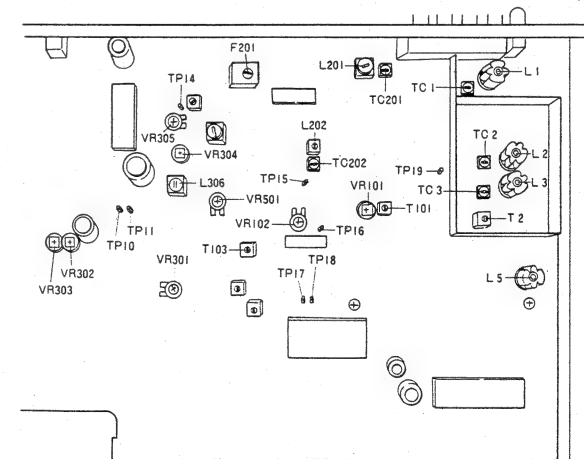


Fig. 11-4 Lugares de ajuste

Lugar de ajuste	Nombre de ajuste
L1, TC1	FM ANT
L2, TC2 L3, TC3	FM RF
L5	FM OSC
T2	FM IFT
T101	FM WIDE IFT
T103	FM discreto
L306	Piloto de cancelación
L201, TC201	AM ANT
L202, TC202	AM OSC
VR101	Ganancia de F1 (WIDE)
VR102	Nivel de MUTE
VR301	Ajuste central de V
VR302	Separación de R → L
VR303	Separación de L → R
VR501	REC LEVEL
VR304	VCO (38kHz)
VR305	Cancelación de piloto

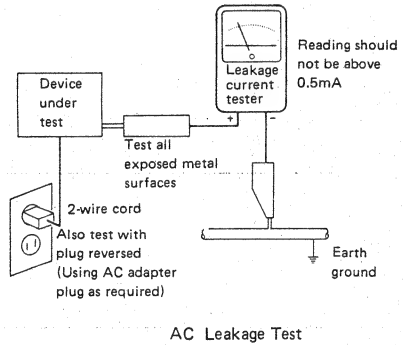
12. SAFETY INFORMATION

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚡ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

13. FOR HE AND HB TYPES

The HE and HB types are the same as the KU type with the exception of the following sections.

Contrast of Miscellaneous Parts

Mark	Symbol & Description	Part No.			Remarks
		KU type	HE type	HB type	
⚡ ★	Tuner ass'y	GWE-210	GWE-211	GWE-211	
	AM stereo ass'y	no supply	...	...	
	Terminal ass'y	no supply	...	...	
	T1 Power transformer (120V)	ATS-022	...	...	
	(220V, 240V)	...	ATS-023	ATS-023	
	AC power cord	ADG-052	ADG-068	ADG-063	
	Coaxial connector	AKX-056	...	...	
	Operating instructions (English)	ARB-562	...	ARB-562	
⚡	(English, French, German, Italian)	...	ARE-074	...	
	Packing case	AHE-210	AHE-211	AHE-210	

The Tuner ass'y GWE-211 (for HE and HB types) is the same as the GWE-210 (for KU type) with the exception of the following sections.

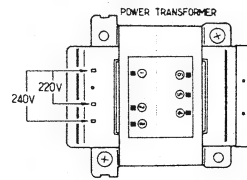
Mark	Symbol & Description	Part No.		Remarks
		GWE-210	GWE-211	
★★	Terminal (ANTENNA)	AKA-019	AKA-021	
	F203 10kHz filter	ATF-144	...	
	F203 9kHz filter	...	ATF-137	
	Q515	...	2SA1115	
			(2SA733A)	
	C334, C339	CQSA 222J 50	CQSA 152J 50	
	R565	...	RD4PM 121J	
	R563, R564	...	RD4PM 102J	
	R566	...	RD4PM 330J	
	R567	RD4PM 680J	...	

Line Voltage Selection

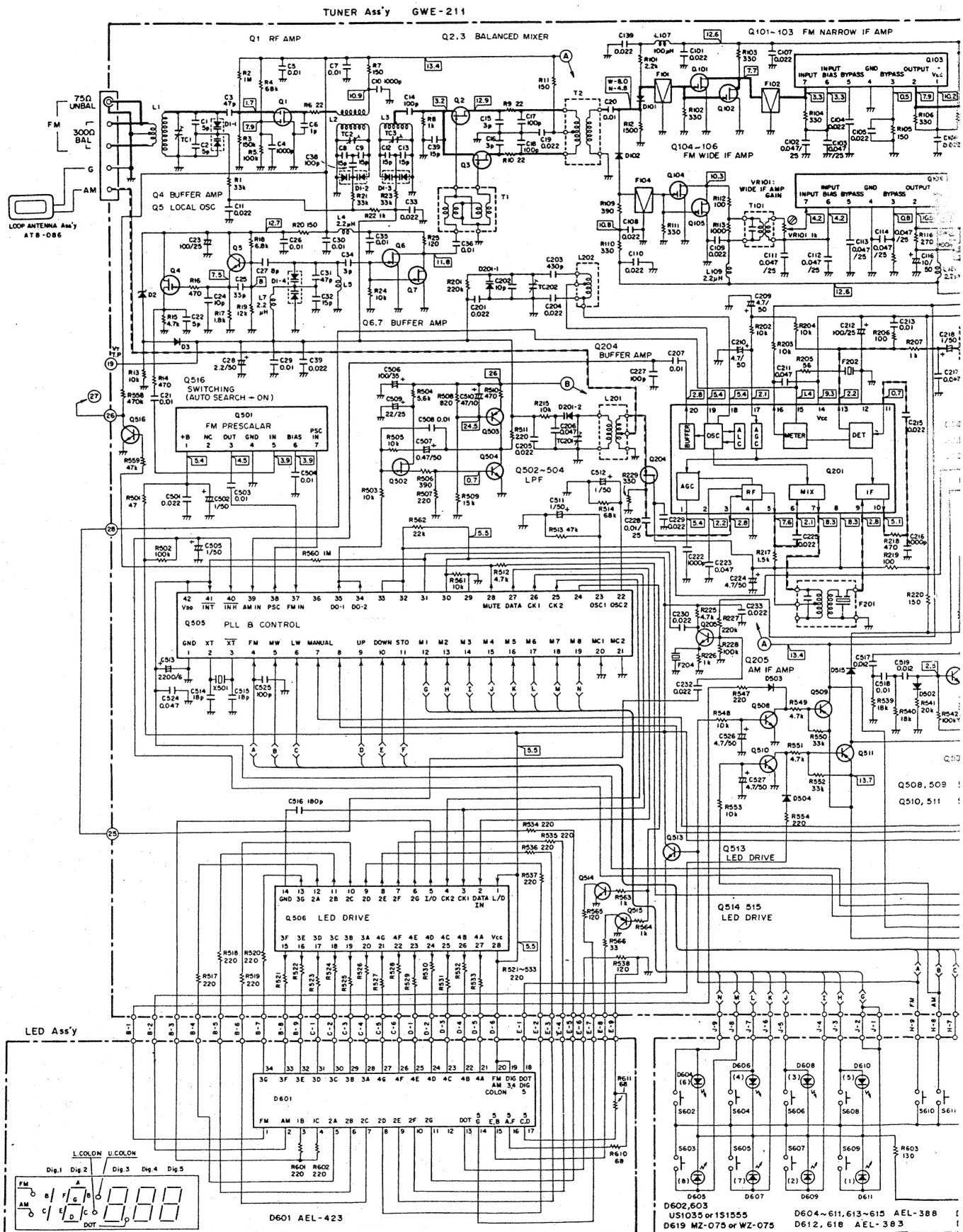
Line voltage can be changed with following steps.

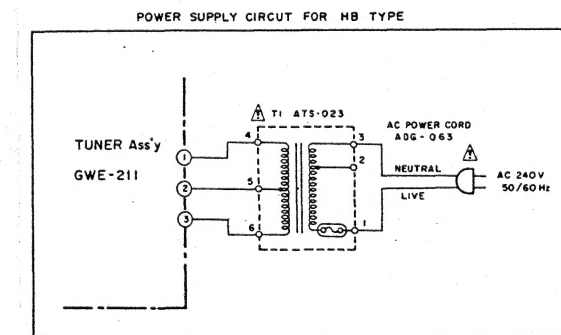
1. Disconnect the AC power cord.
2. Remove the top cover.
3. Change the connection of the power transformer primary taps.
4. Stick the line voltage label on the rear panel.

Part No.	Description
AAX-193	220V label
AAX-192	240V label



# SCHEMATIC DIAGRAM





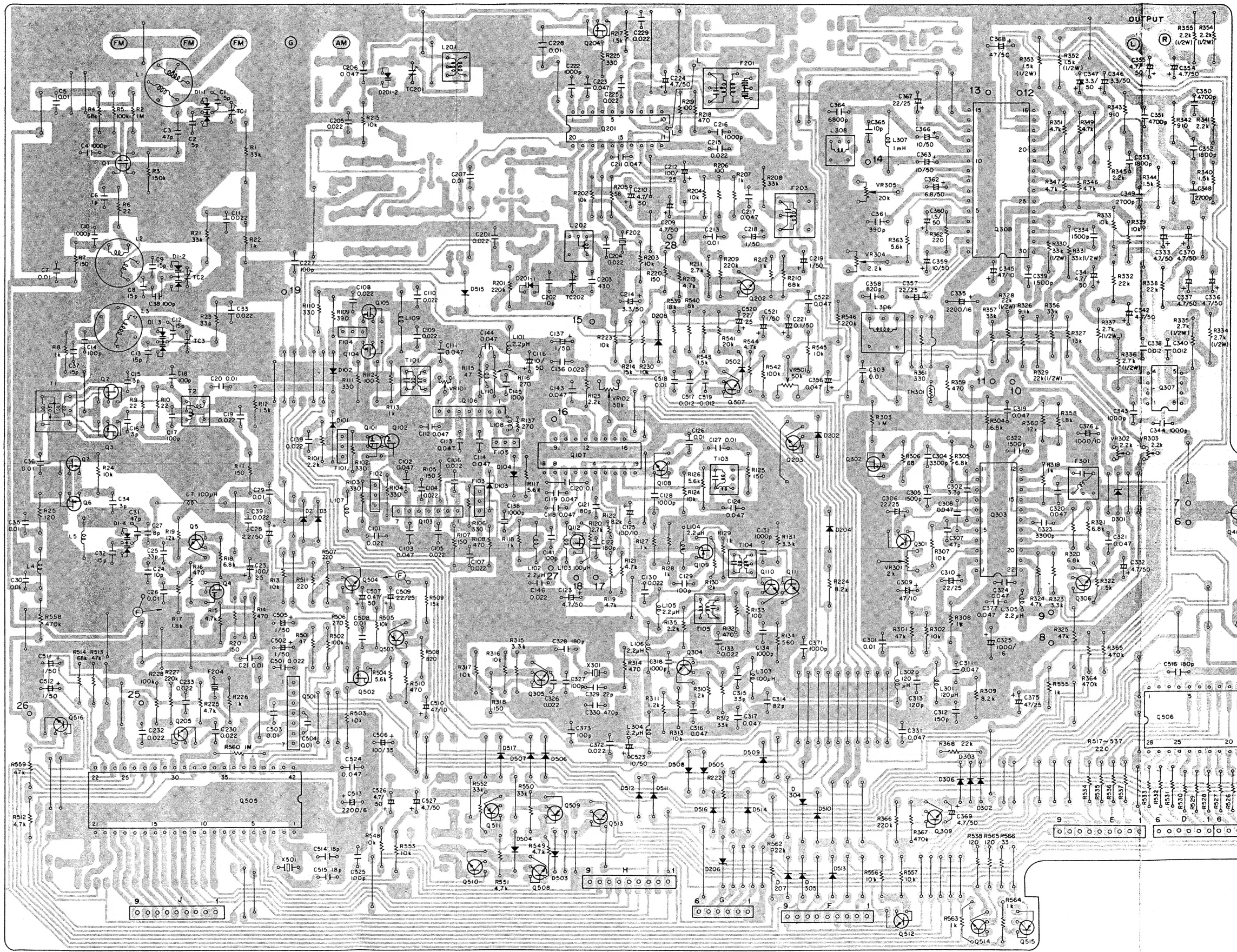
**NOTE:**  
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



P.C. BOARD PATTERNS  
Tuner Assembly (GWE-211)

Q516 Q7 Q2 Q3 Q205 Q505 Q501 Q104 Q101 Q105 Q510 Q511 Q305 Q112 Q513 Q304 Q108 Q109 Q507 Q110 Q111 Q302 Q301 Q512 Q309 Q514 Q308 Q515 Q306 Q506 Q307

TC2 TC1 TC201 VR101 TC202 VR102 VR501 VR304 VR301 VR305 VR302 VR303



Q1 P  
Q2,3 2  
Q103,104  
Q107 P  
Q201 L  
Q303 P  
Q307 M  
Q308 P  
Q501 T  
Q505 T  
Q506 T  
Q5,101  
Q6,7,105  
Q101,102  
Q202,2  
Q401,4  
Q504,5  
Q204,2  
Q304,30  
Q403,4C  
Q404,4C  
Q503,51  
Q509,2  
Q302,5  
Q513,2

Q403 Q402  
Q405 Q406 C

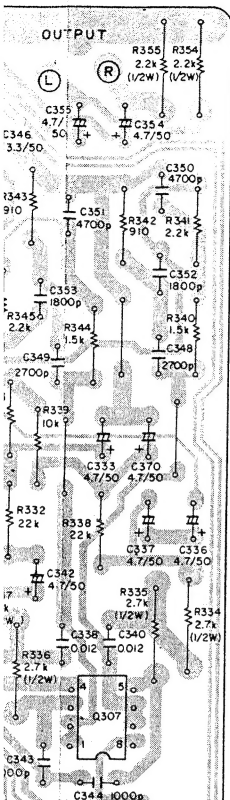
7

8

9

Q506  
Q307

1302 VR303



Q1 P001  
Q2,3 2SK125  
Q103,106  $\mu$ PC1163H  
Q107 PA3007-A  
Q201 LA1247  
Q303 PA5006  
Q307 M5218P  
Q308 PA5007  
Q501 TD6104P  
Q505 TC9157P  
Q506 TD6301AP  
  
Q5,108,110,111  
2SC1923  
Q6,7,109,4,  
Q101,102,104,105  
2SK241  
Q202,203,301,306,309,  
Q401,402,406,  
Q504,507,508,510,512,514,516  
2SC2603 or 2SC945A  
Q204 2SK246  
Q304,305,205 2SC1923  
Q403,405 2SB834  
Q404,407 2SK246  
Q503,511,515 2SA1115 or 2SA733A  
Q509 2SB560  
Q302,502 2SK246  
Q513 2SD438

D1 KV1320A-4  
D2,206 MZ-075  
D3,202,204,302~306,207  
D413~416,501~517,208  
US1035  
D101~104 1S2076  
D201 KV1226-Y  
D301,402,403,417  
KZL083  
D401,405 KZL061  
D404 WZ-290  
D406 WZ-048  
D407,408 10DF2FD  
D409~412 10DF2FD  
  
TH301 TH103-2  
D418 WZ-032

Q403 Q402 Q404 Q401  
Q405 Q406 Q407

